PURCHASING DEPARTMENT
County of Hidalgo

2812 S. Bus. Hwy 2811
Edinburg, Texas 78539
Phone: (956) 318-2626
Fax: (956) 318-2629
www.co.hidalgo.tx.us/purchasing

TRANSMITTAL FORM

Today's Date: 11/25/2020 Department: 121 - Commissioner Precinct 1

Contract No.: C-18-181A-03-26 Effective Date: 03/26/2019

Description of Project: GMP No.1 - Sunset Park Operations Facility - Pct.1

Awarded Vendor: E-Con Group, LLC

CC Approval on 11/17/2020 AI- 78259

Routing of documents:

✓ 1. Executive Office – Attn: Monica Salinas

✓ 2. District Attorney's Office – Attn: David Cantu

✓ 3. County Judge's Office – Attn: Richard F. Cortez

____ 4. County Clerk's Office – Attn: Arturo Guajardo, Jr.

____ 5. Purchasing Department – Attn: Hector Garcia ext. 4857

ATTENTION COUNTY CLERK'S OFFICE:

Please do not attach the following to the minutes of this agenda due to the confidential nature of the information contained herein:

- ☐ Contract/Agreement
- ☐ Exhibit A – RFB Procurement Packet
- ☐ Exhibit B – Fee Schedule/Bid Page (Pgs. ____ to ____)
- ☐ Exhibit C – Certificate of Liability Insurance
- ☑ Other: Exhibit A-3 Insurance Certificates / Notice to Proceed

AIA® Document A133™ – 2009 Exhibit A

Guaranteed Maximum Price Amendment

for the following PROJECT:
(Name and address or location)

Sunset Park Operations Facility (Precinct No. 1)
FM 1015 Off of Mile 11 North & 1 ½
Mercedes, TX 78570
(956) 968-8733

THE OWNER:
(Name, legal status and address)

County of Hidalgo
100 East Cano, 2nd Floor
Edinburg, TX 78539
(956) 318-2600

THE CONSTRUCTION MANAGER:
(Name, legal status and address)

E-Con Group, LLC a Texas limited liability company
3025 Sugar Road
Edinburg, Texas 78540
(956) 259-8005

This amendment dated the 17th day of November, 2020, is between the Owner and the Construction Manager, and amends that certain agreement (C-18-181A-03-26) made as of the 26th day of March, 2019, between the Owner and Construction Manager with respect to the Project (the "Agreement"). Any term defined in the Agreement and used herein shall have the meaning given such term in the Agreement unless otherwise defined herein.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ARTICLE A.1
§ A.1.1 Guaranteed Maximum Price
Pursuant to Section 2.2.6 of the Agreement, the Owner and Construction Manager hereby amend the Agreement to establish a Guaranteed Maximum Price. As agreed by the Owner and Construction Manager, the Guaranteed Maximum Price is an amount that the Contract Sum shall not exceed. The Contract Sum consists of the Construction Manager's Fee plus the Cost of the Work, as that term is defined in Article 6 of this Agreement.

§ A.1.1.1 The Contract Sum is guaranteed by the Construction Manager not to exceed One Million Six Hundred Sixty-Three Thousand One Hundred One and 00/100 Dollars ($ 1,663,131.00), subject to additions and deductions by Change Order as provided in the Contract Documents.

§ A.1.1.2 Itemized Statement of the Guaranteed Maximum Price. Provided below is an itemized statement of the Guaranteed Maximum Price organized by trade categories, allowances, contingencies, alternates, the Construction Manager's Fee, and other items that comprise the Guaranteed Maximum Price.
(Provide below or reference an attachment.)



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User Notes: (3B9ADA51)

Init.
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Please see attached "Exhibit A-2"

§ A.1.1.3 The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the Contract Documents permit the Owner to accept other alternates subsequent to the execution of this Amendment, attach a schedule of such other alternates showing the amount for each and the date when the amount expires.)

N/A

§ A.1.1.4 Allowances included in the Guaranteed Maximum Price, if any: N/A
(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price ($0.00)

§ A.1.1.5 Assumptions, if any, on which the Guaranteed Maximum Price is based:

1. As per the Hidalgo County Fire Marshal, no fire sprinkler will be required for the facility.
2. The limits of construction under this amendment extend to the 20' apron around the facility as indicated on the construction drawings.
3. The Owner will be responsible for all site civil work beyond the 20' apron.
4. The Owner will be responsible for providing the water connection to within five feet of the facility (waterline)
5. The Owner will be responsible for providing the sewer connection to within five feet of the facility (sewer line)
6. The Owner will be responsible for all information technology systems (ITS), including but not limited to; data communication, audio, CCTV, access control and intrusion alarm.
7. The Contractor will be responsible for the Fire Alarm System.
8. The Contractor will be responsible for all ITS infrastructure, including but not limited to; conduit, junction boxes, baker boxes, sleeves, pull strings, connections, fittings, etc.
9. The Contractor will coordinate with the Owner's ITS consultant for installation of all ITS components.

§ A.1.1.6 The Guaranteed Maximum Price is based upon the following Supplementary and other Conditions of the Contract: N/A

Document	Title	Date	Pages

§ A.1.1.7 The Guaranteed Maximum Price is based upon the following Specifications:
(Either list the Specifications here, or refer to an exhibit attached to this Agreement.)
Please see attached "Exhibit A-4"

Section	Title	Date	Pages

§ A.1.1.8 The Guaranteed Maximum Price is based upon the following Drawings:
(Either list the Drawings here, or refer to an exhibit attached to this Agreement.)
Please see attached "Exhibit A-5"

Number	Title	Date

§ A.1.1.9 The Guaranteed Maximum Price is based upon the following other documents and information:
(List any other documents or information here, or refer to an exhibit attached to this Agreement.)

N/A

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User Notes: (3B9ADA51)

ARTICLE A.2

§ A.2.1 The anticipated date of Substantial Completion established by this Amendment:

The anticipated date of Substantial Completion will be 220 Calendar days from the issuance of the Notice-to-Proceed document

(Table Deleted)

§ A.2.2 Owner and Construction Manager recognize that time is of the essence in this Agreement and that Owner will suffer financial loss if the Work is not completed within the time specified in this Article A.2, plus any extension thereof allowed in accordance with Article 8 of the A201-2017. Owner and Construction Manager also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by the Owner if the Work is not completed on time. Accordingly, instead of requiring such proof, Owner and Construction Manager agree that as liquidated damages for delay (but not as a penalty) Construction Manager shall pay Owner Five Hundred DollarsDollars ($500.00) per calendar day for each calendar day after the Substantial Completion date noted in this Article A.2 until the Work is substantially complete. Construction Manager should complete and close out the Project within thirty (30) days after Substantial Completion.

It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages that will be sustained by the Owner in the event that the Work is not completed within the agreed time, or within the legally extended time, if any. Said sum shall be considered as liquidated damages only, the exact ascertainment of which is difficult, and in no sense shall be considered a penalty.

§ A.2.2.2 In the A201, including Sections 8.1.1.5 and 15.1.8 thereof, any reference to Section 3.1.1 of the A101 is instead to Section A.2.2 above.

ARTICLE A.3

§ A.3.1 Unless the context otherwise requires, references to sections of the Agreement in this GMP Amendment are to the applicable section of the AIA Document A133–2009, Standard Form of Agreement Between Owner and Construction Manager as Contractor portion of the Agreement (the "A133"), to which this GMP Amendment is Exhibit A. (Upon execution of this GMP Amendment by both parties, this GMP Amendment will replace the form of GMP Amendment attached to the A133 at Exhibit A.)

§ A.3.2 The bonds required pursuant to Section 11.4 of the A201 and Article 8 of theA133 are attached hereto as Exhibit A-1.

§ A.3.3

Updated insurance certificates required pursuant to section 11.1.1.3 of the A201 are attached hereto as Exhibit A-3.

§ A.3.4 In the Table of Articles on page 3 of the A133, the reference to Exhibit A (including Exhibit A-1

EXHBIT A GUARANTEED MAXIMUM PRICE AMENDMENT

EXHIBIT A-1	PAYMENT AND PERFORMANCE BONDS
EXHIBIT A-2	ITEMIZED STATEMENT OF GMP
EXHIBIT A-3	ADDITIONAL INSURANCE CERTIFICATES
EXHIBIT A-4	SPECIFICATIONS ISSUED BY ALVARADO ARCHITECTS AND HALFF ASSOCIATES
EXHIBIT A-5	DRAWINGS ISSUED BY ALVARADO ARCHITECTS AND HALFF ASSOCIATES

§ A.3.5 Except as modified herein, all terms and conditions of the Agreement, as amended by this GMP Amendment, remain in full force and effect, and Construction Manager and Owner ratify and confirm the terms and provisions of the Agreement, as amended by this GMP Amendment.

Init.
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User Notes: (3B9ADA51)

HIDALGO COUNTY

By: Richard F Cortez

Richard F. Cortez, County Judge

E-CON GROUP, LLC CONSTRUCTION, LLC

By:

Gilbert Enriquez, President

ATTEST:

APPROVED AS TO FORM FOR COUNTY:
Hidalgo County Criminal District Attorney's Office
Ricardo Rodriguez, Jr.

By: David R. Cantu

David R. Cantu, Assistant District Attorney

COMMISSIONERS COURT HIDALGO COUNTY, TEXAS

Arturo Guajardo Jr.

Arturo Guajardo, Jr., County Clerk

APPROVED BY COMMISSIONERS' COURT ON: 11/17/20

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EXHIBIT A-1

to

November 17, 2020 GMP Amendment

to

Agreement dated March 26, 2019 between
Hidalgo County and E-Con Group, LLC
Sunset Park Operations Facility (Precinct No. 1)

Payment and Performance Bonds
(Original bonds to be attached to Hidalgo County's Original GMP Amendment and a copy of the bonds to be attached to the Construction Manager's Original)

Statutory Performance Bond Pursuant to Chapter 2253
Of The Texas Government Code
(Public Work)
(Penalty of this Bond must be 100% of Contract Amount)

Bond# 65BCSIC9584

KNOW ALL MEN BY THESE PRESENTS, That E-Con Group, LLC

(hereinafter called the Principal), as Principal, and Hartford Fire Insurance Company

(hereinafter called Surety), as Surety, are held and firmly bound unto

Hidalgo County

(hereinafter called the Obligee), in the amount of One Million Six Hundred Sixty Three Thousand One Hundred Thirty One and no/100**

Dollars ($ 1,663,131.00 **)**

for the payment whereof the said Principal and Surety bind themselves and heir heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the 10th day of November, 2020 for Sunset Park Operations Facility (Precinct No. 1)

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform the work in accordance with the plans, specifications and contract documents, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitations of said Chapter to the same extent as if it were copied at length herein.

SURETY, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract, or to the work performed thereunder, or the plans, specifications or drawings accompanying the same, shall in anywise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work to be performed thereunder.

IN WITNESS WHEREOF, the said Principal and Surety have signed this instrument this day 12th

of November, 2020

Witness

E-Con Group, LLC

By:
Gilbert Enriquez, President

Witness

Hartford Fire Insurance Company

By:
Andy Alvarez , Attorney-In-Fact

Statutory Payment Bond Pursuant to Chapter 2253
Of The Texas Government Code Bond# 65BCSIC9584
(Public Work)
(Penalty of this Bond must be 100% of Contract Amount)

KNOW ALL MEN BY THESE PRESENTS, That E-Con Group, LLC

hereinafter called the Principal), as Principal, and Hartford Fire Insurance Company

(hereinafter called the Surety), as Surety, are held and firmly bound unto
County of Hidalgo

(hereinafter called the Obligee), in the amount of One Million Six Hundred Sixty Three Thousand One Hundred Thirty One and no/100*** **Dollars ($** 1,663,131.00 **)**

for the payment of whereof the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the 10th day of November, 2020 for Sunset Park Operations Facility (Precinct No. 1)

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the work provided for in said contract, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitation of said Chapter to the same extent as if it were copied at length herein.

SURETY, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract, or to the work performed thereunder, or the plans, specifications or drawings accompanying the same, shall in anywise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work to be performed thereunder,

IN WITNESS WHEREOF, the said Principal and Surety have signed this instrument this day 12th

of November, 2020

Witness

E-Con Group, LLC

By:
Gilbert Enriquez, President

Witness

Hartford Fire Insurance Company

By:
Andy Alvarez Attorney-In-Fact

POWER OF ATTORNEY

Direct Inquiries/Claims to:
THE HARTFORD
Bond T-4
One Hartford Plaza
Hartford, Connecticut 06155
call: **888-266-3488** *or fax:* **860-757-5835)**

KNOW ALL PERSONS BY THESE PRESENTS THAT: **Agency Code:** 65-813646

- [X] **Hartford Fire Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [X] **Hartford Casualty Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Accident and Indemnity Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Hartford Underwriters Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Twin City Fire Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of Illinois**, a corporation duly organized under the laws of the State of Illinois
- [ ] **Hartford Insurance Company of the Midwest**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of the Southeast,** a corporation duly organized under the laws of the State of Florida

having their home office in Hartford, Connecticut (hereinafter collectively referred to as the "Companies") do hereby make, constitute and appoint, ***up to the amount of*** Unlimited :
Andy Alvarez, Phil Young, Dewey Young of SAN JUAN, Texas

their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign its name as surety(ies) only as delineated above by ☒, and to execute, seal and acknowledge any and all bonds, undertakings, contracts and other written instruments in the nature thereof, on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

In Witness Whereof, and as authorized by a Resolution of the Board of Directors of the Companies on August 1, 2009, the Companies have caused these presents to be signed by its Vice President and its corporate seals to be hereto affixed, duly attested by its Assistant Secretary. Further, pursuant to Resolution of the Board of Directors of the Companies, the Companies hereby unambiguously affirm that they are and will be bound by any mechanically applied signatures applied to this Power of Attorney.

Wesley W. Cowling, Assistant Secretary

M. Ross Fisher, Vice President

STATE OF CONNECTICUT
COUNTY OF HARTFORD } ss. Hartford

On this 12th day of July, 2012, before me personally came M. Ross Fisher, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Hartford, State of Connecticut; that he is the Vice President of the Companies, the corporations described in and which executed the above instrument; that he knows the seals of the said corporations; that the seals affixed to the said instrument are such corporate seals; that they were so affixed by authority of the Boards of Directors of said corporations and that he signed his name thereto by like authority.

Kathleen T. Maynard
Notary Public
My Commission Expires July 31, 2016

CERTIFICATE

I, the undersigned, Vice President of the Companies, DO HEREBY CERTIFY that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is still in full force effective as of November 12th, 2020
Signed and sealed at the City of Hartford.

Gary W. Stumper, Vice President

IMPORTANT NOTICE

To obtain information or make a complaint:
You may contact your Agent.

You may call The Hartford's Consumer Affairs toll-free telephone number for information or to make a complaint at:
1-800-451-6944

You may contact the Texas Department of Insurance to obtain information on companies, coverages, rights, or complaints at:
1-800-252-3439

You may write the Texas Department of Insurance:
P.O. Box 149104
Austin, TX 78714-9104
Fax: (512) 490-1007
Web: *www.tdi.texas.gov*
E-mail: *ConsumerProtection@tdi.texas.gov*

PREMIUM OR CLAIM DISPUTES:
Should you have a dispute concerning your premium or about a claim, you should contact the (agent) (company) (agent or the company) first. If the dispute is not resolved, you may contact the Texas Department of Insurance.

ATTACH THIS NOTICE TO YOUR POLICY:
This notice is for information only and does not become a part or condition of the attached document.

EXHIBIT A-2

to

November 17, 2020 GMP Amendment

to

Agreement dated March 26, 2019 between
Hidalgo County and E-Con Group, LLC
Sunset Park Operations Facility (Precinct No. 1)

Itemized Statement of GMP
(See attached pages)

Sunset Park Operations Facility

ENRIQUEZ CONSTRUCTION

October 28, 2020

A. GMP at 95% CDs

B.

C.

D.

DESCRIPTION	A	B	C	D
Div 1 General Requirements				
General Conditions	84,300	0	0	0
DIV 1 SUBTOTAL	**84,300**	**0**	**0**	**0**
Div 2 Sitework				
Building Pad Only	128,980	0	0	0
Erosion Control	0	0	0	0
Concrete Paving, Curbs, Sidewalks, Signs, Markings	0	0	0	0
Final Grading	0	0	0	0
Water Service	0		0	0
Brick Pavers	3,200		0	0
Termite Control	1,500		0	0
	0	0	0	0
	0		0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
DIV 2 SUBTOTAL	**133,680**	**0**	**0**	**0**
Div 3 Concrete				
Concrete Foundation	84,000	0	0	0
Concrete Reinforcing Steel	14,060	0	0	0
Splash Blocks	1,800	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
DIV 3 SUBTOTAL	**99,860**	**0**	**0**	**0**
Div 4 Masonry				
Masonry	12,400	0	0	0
Masonry Reinforcing Steel	141	0	0	0
DIV 4 SUBTOTAL	**12,541**	**0**	**0**	**0**

Sunset Park Operations Facility

ENRIQUEZ CONSTRUCTION

Div 5 Metals				
Structural Steel	0	0	0	0
Steel Joists & Steel Deck	0	0	0	0
Metal Fabrications	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
DIV 5 SUBTOTAL	**0**	**0**	**0**	**0**
Div 6 Wood, Plastics, Composites				
Lumber	2,500	0	0	0
Rough carpentry (labor)	1,500	0	0	0
Architectural Woodwork	25,300	0	0	0
		0	0	0
DIV 6 SUBTOTAL	**29,300**	**0**	**0**	**0**
Div 7 Thermal & Moisture Protection				
Batt Insulation	0	0	0	0
Firestopping	1,200	0	0	0
Joint Sealants	4,002	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
DIV 7 SUBTOTAL	**5,202**	**0**	**0**	**0**
Div 8 Openings				
Hollow Metal Frames & Doors	50,500	0	0	0
installation of HM frames	2,475	0	0	0
Wood Doors	0	0	0	0
Installation of Doors	2,475	0	0	0
Finish hardware	0	0	0	0
Installation of Finish Hardware	3,300	0	0	0
Overhead Coiling Doors (Manual)	59,327	0	0	0
Aluminum Windows and Storefront	11,660	0	0	0
Glazing	0	0	0	0
Access Doors	1,000	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
DIV 8 SUBTOTAL	**130,737**	**0**	**0**	**0**

Sunset Park Operations Facility

ENRIQUEZ CONSTRUCTION

Div 9 Finishes				
Gypsum Board	100,000	0	0	0
Acoustical Panel Ceilings	0	0	0	0
Resilient Tile Flooring	10,000	0	0	0
Resilient Base	0	0	0	0
Painting and Concrete Sealed Floors	40,000	0	0	0
FRP Panels at Restrooms	3,500	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
DIV 9 SUBTOTAL	**153,500**	**0**	**0**	**0**
Div 10 Specialties				
Graphics	4,500	0	0	0
Installation of Graphics	1,000	0	0	0
Aluminum Flagpole	3,500	0	0	0
Installation of Flagpole	500	0	0	0
Toilet Partitions	2,500	0	0	0
Installation of TP	500	0	0	0
Toilet Accessories	3,500	0	0	0
Installation of Toilet Accessories	1,200	0	0	0
Fire Extinguishers & Cabinets	1,000	0	0	0
Installation of FEC	500	0	0	0
Corner Guards	1,500	0	0	0
Installation of Corner Guards	500	0	0	0
Metal Lockers	10,000	0	0	0
Installation of Metal Lockers	3,500	0	0	0
DIV 10 SUBTOTAL	**34,200**	**0**	**0**	**0**
Div 11 Equipment				
N/A	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
DIV 11 SUBTOTAL	**0**	**0**	**0**	**0**
Div 12 Furnishings				
Horizontal Blinds	2,500			
	0	0	0	0
DIV 12 SUBTOTAL	**2,500**	**0**	**0**	**0**

Sunset Park Operations Facility

ENRIQUEZ CONSTRUCTION

Div 13 Special Construction				
Metal Building System	257,637			
DIV 13 SUBTOTAL	**257,637**	**0**	**0**	**0**
Div 14 Conveying Systems				
N/A				
DIV 14 SUBTOTAL	**0**	**0**	**0**	**0**
Div 15 Plumbing & Mechanical				
Plumbing	95,000	0	0	0
Water Meter	3,000	0	0	0
HVAC System	211,965	0	0	0
Test and Balance	2,325	0	0	0
	0	0	0	0
		0	0	0
DIV 15 SUBTOTAL	**312,290**	**0**	**0**	**0**
Div 16 Electrical				
Electrical	291,264	0	0	0
Fire Alarm System	21,000	0	0	0
	0	0	0	0
		0	0	0
		0	0	0
		0	0	0
		0	0	0
		0	0	0
DIV 16 SUBTOTAL	**312,264**	**0**	**0**	**0**
TOTAL CONSTRUCTION COST (DIVISION TOTALS)	**1,568,011**	**0**	**0**	**0**
Contingency				
Allowance - Owner Contingency	0	0	0	0
Allowance - Lab testing by Owner	0	0	0	0
CONTINGENCY SUBTOTAL	**0**	**0**	**0**	**0**
DIVISION TOTALS + CONTINGENCIES	**1,568,011**	**0**	**0**	**0**
General Liability Insurance/Bldrs Risk	5,000	0	0	0
Building Permit	5,000	0	0	0
Payment / Performance Bonds	22,400	0	0	0
Subcontractor's Bonds				
SUBTOTAL	**32,400**	**0**	**0**	**0**

Sunset Park Operations Facility

ENRIQUEZ CONSTRUCTION

Contractor's Fee 4%	62,720	0	0	0
TOTAL BUDGET	1,663,131	0	0	0

EXHIBIT A-3

to

November 17, 2020 GMP Amendment

to

Agreement dated March 26, 2019 between
Hidalgo County and E-Con Group, LLC
Sunset Park Operations Facility (Precinct No. 1)

Construction Manager's Additional Insurance Certificates
(See attached pages)

EXHIBIT A-4

to

November 17, 2020 GMP Amendment

to

Agreement dated March 26, 2019 between
Hidalgo County and E-Con Group, LLC
Sunset Park Operations Facility (Precinct No. 1)

Specifications Issued By Alvarado Architects and Halff Associates
(See attached pages)

Project Manual

for

Hidalgo County Precinct 1 – Sunset Park Operations Facility (RFP #2018-18-11)

for the

COUNTY OF HIDALGO, TEXAS

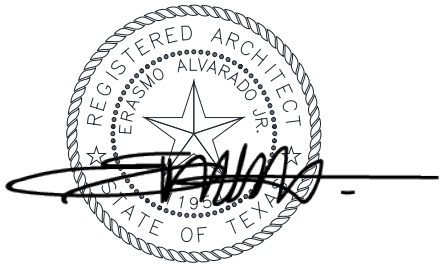
Volume 1 – Divisions 01 00 00 – 33 00 00

November 06, 2020

Project No.: 1718

ISSUED FOR CONSTRUCTION

Erasmo D. Alvarado, Jr. AIA, Registration # 11954



11/06/20

307 South Main Street
Donna, Texas 78537
(956) 464-8258

Project Manual

for

Hidalgo County Precinct 1 – Sunset Park Operations Facility (RFP #2018-18-11)

for the

COUNTY OF HIDALGO, TEXAS

Volume 1 – Divisions 01 00 00 – 33 00 00

April 26, 2019

Project No.: 1718

ISSUED FOR CONSTRUCTION

Erasmo D. Alvarado, Jr. AIA, Registration # 11954

Hidalgo County Commissioners

Mr. David L. Fuentes	Commissioner, Precinct 1
Mr. Eduardo “Eddie” Cantu	Commissioner, Precinct 2
Mr. Joe M. Flores	Commissioner, Precinct 3
Ms. Ellie Torres	Commissioner, Precinct 4

Mr. Richard F. Cortez — Hidalgo County Judge

307 South Main Street
Donna, Texas 78537
(956) 464-8258

Project Manual

for

Hidalgo County Precinct 1 – Sunset Park Operations Facility (RFP #2018-18-11)

for the

COUNTY OF HIDALGO, TEXAS

Volume 1 – Divisions 01 00 00 – 33 00 00

April 26, 2018

Project No.: 1718

ISSUED FOR CONSTRUCTION

Erasmo D. Alvarado, Jr. AIA, Registration # 11954

Consultants:

Structural Engineer:
Chanin Engineering, LLC
400 W. Nolana Avenue
McAllen, Texas 78504
Ph: (956) 687-9421

MEP/Technology Engineer:
Halff Engineering
5000 W. Military Hwy, Ste. 100
McAllen, Texas 78503
Ph: (956) 664-1960

Civil Engineer:
Halff Engineering
5000 W. Military Hwy, Ste. 100
McAllen, Texas 78503
Ph: (956) 664-1960

Project Manager:
B2Z Engineering
900 S. Stewart Road
Mission, Texas 78572
Ph: (956) 585-3773

307 South Main Street
Donna, Texas 78537
(956) 464-8258

INSTRUCTION TO BIDDERS

1. RECEIPT AND OPENING OF PROPOSALS

E-Con Group, LLC (hereinafter called "CMAR") invite proposals on the Hidalgo County Pct. 1 Sunset Park Operations Facility project. Proposals must be submitted to the CMAR no later than the date and time given below in a sealed envelope and addressed as shown below.

PROJECT:	Hidalgo County Pct. 1 Sunset Park Operations Facility
DUE DATE AND TIME:	Thursday, April 18, 2019 at 4pm
PLACE OF OPENING:	E-Con Group 3025 S. Sugar Road, Edinburg, TX 78539
ADDRESS ENVELOPE:	E-Con Group Gilbert Enriquez Hidalgo County Pct. 1 Sunset Park Operations Facility April 18, 2019 at 4pm

2. ITEMS REQUIRED FOR PROPOSAL

   A. Company Proposal
   B. List of projects completed
   C. References
   D. Current Financial Statement

3. CONDITIONS OF WORK

Each Proposer must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful proposer of his obligations to furnish all materials and labor necessary to carry out the provisions of this contract. Proposers shall carefully examine the Construction Documents and the construction site to familiarize themselves with existing local conditions under which the Work is to be performed. Proposers shall promptly notify the CMAR of any ambiguity, inconsistency or error which they may discover upon examination of the Construction Documents or of the Site and local conditions. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes and ordinances the Sub-Contractor shall provide the better quality or greater quantity of work or comply with the more stringent requirement.

4. SELECTION CRITERIA

In determining whether and to whom to award a contract, the CMAR will base its selection on a point system to evaluate the proposals and will consider the following criteria.

A. Price Proposal	60 points
B. List of projects completed	25 points
C. Current Financial Statements	10 points
D. References	5 points

STATE OF TEXAS §

COUNTY OF HIDALGO §

SOUTH TEXAS COLLEGE §

INTERLOCAL AGREEMENT FOR COST SHARING OF WAGE RATE STUDY

The purpose of this Interlocal Agreement is to set out the terms of an agreement between South Texas College (the "College") and the County of Hidalgo (the "County"), and jointly (the "Parties") to share certain wage rate data required to be used by the parties for purposes of enforcement of wage rates under the provisions of Texas Government Code Section 2258.001, et seq.

WITNESSETH THAT:

Background

I.

1.1. In Texas, local government political subdivisions may enter into inter-local agreements, authorized in certain circumstances under provisions of Texas Government Code Section 791.035 of the Interlocal Government Cooperation Act (the "Act"), for the express purposes of cooperating to advance their mutual governmental purposes or with respect to governmental functions in which the contracting parties are mutually interested.

1.2. Political subdivisions may assist each other by granting funds to each other, provided that funds granted by one political subdivision to another are used for a definitive "public purpose" of the granting subdivision.

1.3. Those governmental functions and services which are of mutual concern to the County and the College and which each is independently legally authorized to perform or provide under state law, include the construction of public buildings facilities for the furtherance of governmental purposes.

1.4. A contract entered into between contracting entities under the Act may contain any provisions that the governing bodies of the contracting entities consider reasonably necessary. Contracting entities may provide by contract, on mutually agreeable terms, the financial commitment each will undertake, and for the term thereof, whether they shall jointly maintain a project or whether one of them shall operate and maintain a project under its exclusive direction and control while the other entity(ies) contribute to the expenses of construction and/or operation or maintenance.

1.5. The governing bodies of the College and the County find that constituents of each political subdivision will benefit from the joint efforts of the parties resulting from this agreement.

II.

2.1 An institution of higher education, such as the College, is authorized under the Texas Education Code and the County is authorized under its enabling legislation, to undertake the construction of buildings and other public facilities and to engage the services of construction contractors to construct public projects. In undertaking that process, a political subdivision of the state, when engaging contractors on a public work project, is obligated to comply with provisions of Government Code, Section 2258.021 with respect to establishing reasonable wage rates for workers employed by prime contractors and subcontractors of a political subdivision of the state on a public work project.

2.2. Under the Act, the College and the County may enter into this interlocal agreement to share costs associated with obtaining relevant data, preparing a wage rate study and adopting wage rates.

III.

The County and the College agree to the following terms:

3.1. The Parties acknowledge that the College has previously undertaken a Wage Rate Study, prepared on its behalf, by Broaddus & Associates, dated April 26, 2016, now finalized and operative and may be used by the County.

3.2 On behalf of the Parties, College shall cause a contract to be entered into between College and Broaddus & Associates, under the terms of which additional and updated data shall be obtained and the results thereof incorporated in the Wage Rate Study such that the data may be used by the parties for the period of three years from the date of issuance.

3.3 The cost of the study update, $15,260, shall be paid by the County in full in advance and within 30 days of signing this agreement.

3.4 In consideration of the County's payment, the College shall authorize County full use of the current Wage Rate Study.

Approved on the 15th day of June, 2018.

SOUTH TEXAS COLLEGE

By: _____
Dr. SHIRLEY A. REED
President

Adopted on the 19th day of June, 2018.

COUNTY OF HIDALGO

By: _____
RAMON GARCIA
County Judge

APPROVED BY
COMMISSIONERS' COURT
ON: 6/19/18

U.S. POSTAGE PITNEY BOWES

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First Class Mail
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RAMON GARCIA
Office of the County Judge
P.O. Box 1356 • Edinburg, Texas 78540

THE COUNTY OF HIDALGO TEXAS

REC'D JUN 22 2018 leg

MARY G. ELIZONDO
P.O. BOX 9701
MCALLEN, TX 78502-9701

SOUTH TEXAS COLLEGE

Mary G. Elizondo, Vice President
Finance & Administrative Services
Tel.: 872-3558 / Fax: 872-8304
marye@southtexascollege.edu

Date: 07/16/18

- ☐ Dr. Shirley A. Reed
- ☐ Dr. Anahid Petrosian
- ☐ Dr. David Plummer
- ☐ Mr. Matthew Hebbard
- ☒ Becky Cavazos
- ☐ Brenda Balderaz
- ☐ George McCaleb
- ☐ Paul Varville
- ☐ Rick de la Garza
- ☐ _____
- ☐ Business Office _____

☐ Urgent ☐ For Your Info. ☐ For Your Signature

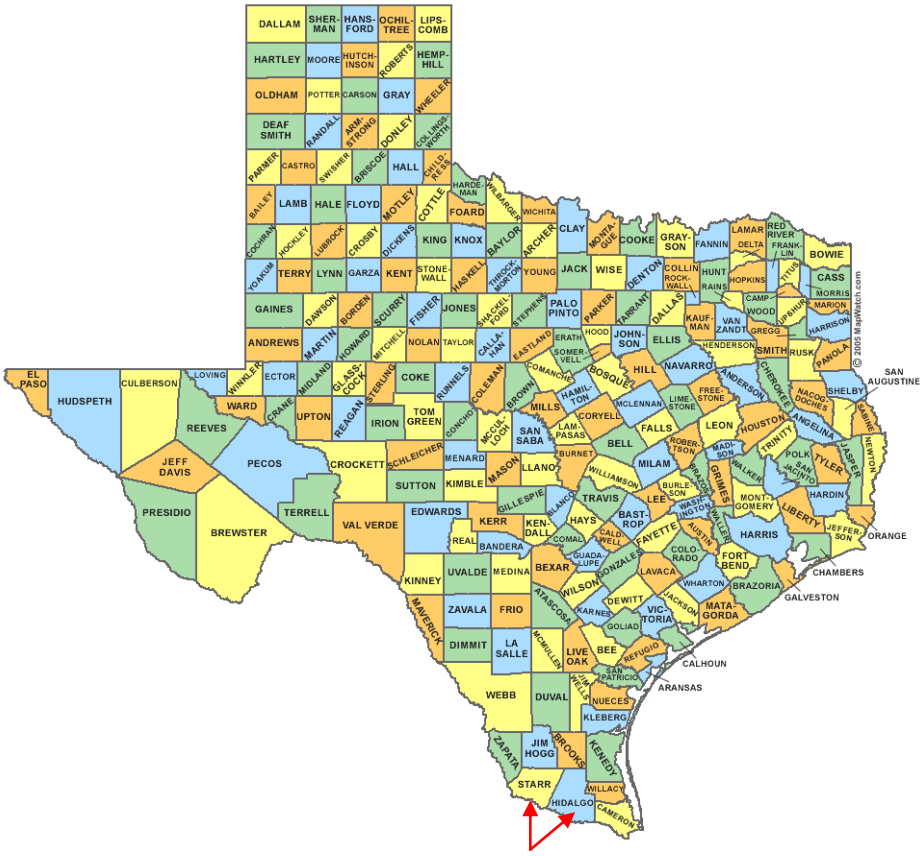
☐ Comments:

Original Interlocal Agreement for Cost Sharing of Texas Fate Study

Mary G

Building Construction Trades
Prevailing Wage Rates Determination

SOUTH TEXAS COLLEGE



April 26, 2016

Broaddus & Associates
1100 E. Jasmine
Suite 102
McAllen, Texas 78503

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II. SURVEY METHODOLOGY

A. Project Profiles
B. Prevailing Wage Rates
C. Updating the Wage Rate Data Base

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B. Table B – Employee Pay Rates Form

I. PURPOSE

The purpose of this initiative is to establish legitimate prevailing wages associated with the various construction worker classifications. The requirement to employ Prevailing Wages is detailed in Texas Government Code, Title 10, Chapter 2258 – Prevailing Wage Rates. In summary, the Code mandates that localities (which may include a municipality, county or district) pay prevailing wage rates for public construction projects or face monetary penalty. The Code defines the method for determining prevailing wages as either by a survey or adoption of the Davis-Bacon (DB) Act determined rates. Many states throughout the US conduct Prevailing Wage Determining Surveys annually – Texas does not.

The consequences of relying on DB wage determinations (common practice in the Valley) are severe, but most notably to owners is the cost impact. Therefore, South Texas College recognizing that it was in their best interest to conduct this survey authorized Broaddus & Associates to execute this endeavor. In addition, the Uniform General Conditions that are part of Construction Contract is very specific on the requirements to be followed for compliance and enforcement of Prevailing Wage Rate Laws. The following is the context that is part of contract:

Uniform General Conditions

Article III- Compliance with and Enforcement of Prevailing Wage Laws

3.1 Duty to Pay Prevailing Wage Rates. The Contractor shall pay not less than the wage scale of the various classes of labor as shown on the "Prevailing Wage Schedule" provided by the Owner. The specified wage rates are minimum rates only. The Owner will not consider any claims for additional compensation made by any Contractor because the Contractor pays wages in excess of the applicable minimum rate contained in the Contract. The "Prevailing Wage Schedule" is not a representation that quantities of qualified labor adequate to perform the Work may be found locally at the specified wage rates.

3.1.1 Each worker shall be classified in one of the classifications in the prevailing wage rate table. The Contractor shall notify each worker commencing work on the contract the worker's job classification and the established minimum wage rate required to be paid, as well as the actual amount being paid. The notice must be delivered to and signed in acknowledgement of receipt by the employee and must list both the monetary wages and fringe benefits to be paid or furnished for each classification in which the worker is assigned duties. When requested, competent evidence of compliance with the Texas Prevailing Wage Law shall be furnished.

3.1.2 A copy of each worker wage rate notification shall be submitted to the ODR with the application for progress payment for the period during which the worker began on-site activities.

3.2 Prevailing Wage Schedule. The "Prevailing Wage Schedule" shall be determined by the Owner in compliance with Chapter 2258, Texas Government Code. Should the Contractor at any time become aware that a particular skill or trade not reflected on the Owner's Prevailing Wage Schedule will be or is being employed in the Work, whether by the Contractor or by a subcontractor, the Contractor shall promptly inform the Owner's Designated Representative

(ODR) and the Owner shall specify a wage rate for that skill or trade, which shall bind the Contractor.

3.3 Penalty for Violation. The Contractor and any Subcontractor shall pay to the Owner a penalty of sixty dollars ($60.00) for each worker employed for each calendar day, or portion thereof, that the worker is paid less than the wage rates stipulated in the Prevailing Wage Schedule or any supplement thereto pursuant to §3.2. The Contractor and each Subcontractor shall keep, or cause to be kept, an accurate record showing the names and occupations of all workers employed in connection with the Work, and showing the actual per diem wages paid to each worker, which records shall be open at all reasonable hours for the inspection by the Owner.

3.4 Complaints of Violations of Prevailing Wage Rates.

3.4.1. Owner's Determination of Good Cause. Within 31 days of receipt of information concerning a violation of Chapter 2258, Texas Government Code, the Owner shall make an initial determination as to whether good cause exists to believe a violation occurred. The Owner's decision on the initial determination shall be reduced to writing and sent to the Contractor or Subcontractor against whom the violation was alleged, and to the affected worker. When a good cause finding is made, the Owner shall retain the full amounts claimed by the claimant or claimants as the difference between wages paid and wages due under the Prevailing Wage Schedule and any supplements thereto, together with the applicable penalties, such amounts being subtracted from successive progress payments pending a final decision on the violation.

3.4.2 Arbitration Required if Violation not Resolved. After the Owner makes its initial determination, the affected Contractor or Subcontractor and worker have 14 days in which to resolve the issue of whether a violation occurred, including the amount that should be retained by Owner or paid to the affected worker. If the Contractor or Subcontractor and affected worker reach an agreement concerning the worker's claim, the Contractor shall promptly notify the Owner in a written document signed by the worker. It the Contractor or Subcontractor and affected worker do not agree before the 15th day after the Owner's determination, the Contractor or Subcontractor and affected worker must participate in binding arbitration in accordance with the Texas General Arbitration Act, Chapter 171, Tex. Civ. Prac. & Rev. Code. The parties to the arbitration have 10 days after the expiration of the 15 days referred to above, to agree on an arbitrator; if by the 11th day there is no agreement to an arbitrator, a district court shall appoint an arbitrator on the petition of any of the parties to the arbitration.

3.4.3 Arbitration Award. If an arbitrator determines that a violation has occurred, the arbitrator shall assess and award against the Contractor or Subcontractor the amount of penalty as provided in § 3.4.1 thereof and the amount owed the worker. The Owner may use any amounts retained under § 3.2 hereof to pay the worker the amount as designated in the arbitration award. If the Owner has not retained enough from the Contractor or Subcontractor to pay the worker in accordance with the arbitration award, the worker has a right of action against the Contractor and Subcontractor as appropriate, and the surety of either to receive the amount owed, attorney's fees and court costs. The Contractor shall promptly furnish a copy of the arbitration award to the Owner.

3.5 Prevailing Wage Retainage. Money retained pursuant to §3.4 shall be used to pay the claimant or claimants the difference between the amount the worker received in wages for labor on the Project at the rate paid by the Contractor or Subcontractor and the amount the worker would have received at the general prevailing wage rate as provided by the agreement of the claimant and the Contractor or Subcontractor affected, or in the arbitrator's award. The full statutory penalty of $60.00 per day of violation per worker shall be retained by the Owner to offset its administrative costs, pursuant to Texas Government Code §2258.023. Any retained funds in excess of these amounts shall be paid to the Contractor on the earlier of the next progress payment or final payment. Provided, however, that the Owner shall have no duty to release any funds to either the claimant or the Contractor until it has received the notices of agreement or the arbitration award as provided under §§3.4.2 and 3.4.3.

3.6 No Extension of Time. If the Owner determines that good cause exists to believe a violation has occurred, the Contractor shall not be entitled to an extension of time for any delay arising directly or indirectly from of the procedures set forth in §3.4.

II. SURVEY METHODOLOGY

The Wage Rate Survey methodology involved several steps. These included:

- Identification of the relevant resources within Hidalgo & Starr Counties
- Development of protocol for estimating District wide wage rates
- Creation of proper forms for worker classification response
- Strategy to generate enough response interest

The Survey Team identified methodology and approach on how to reach out to construction workers with the two county college district. In addition, several resources were utilized to maximize response since other local jurisdictions have not been successful in having enough data to quantify current market conditions. The outreach strategy included:

1. Partner with Rio Grande Valley AGC to communicate survey intent
2. Enlist the support of identified contractors selected for 2013 Bond Construction Program to identify subcontractors
3. Communicate through the local newspaper of Business Development Conference that took place on February 26, 2016
4. Sponsor in conjunction with general contractors a Business Development Conference in order to encourage wage rate response and at same time generate interest for 2013 Bond Construction Bond Program
5. Office phone solicitation to request response(s)

In essence, this effort used several mechanism and tools to distribute both hard copies and electronic copies of the wage rate questionnaire. South Texas College also participated in this survey and provided information that permitted the survey team to contact contractors to secure data. The emphasis to each respondent was that this information was confidential and not to be used or provided outside of this gathering of information.

The wage survey questionnaires initially identified twenty-four categories for worker classification and several blank categories were provided to allow gathering of as much information to reflect worker classification market. Respondents were instructed to provide only hourly payroll data for all workers in each job classification and to provide wage data. Respondents were instructed not to guess or estimate the payroll data. If they did not have all of the payroll data in hand, they were asked to contact the relevant subcontractor decision makers to secure the data.

A. Project Profiles

The wage rates are based on survey data from two hundred and three respondents and sixty-three companies. It was also determined that the minimum of three respondents were adequate to gauge the market condition for each of the worker classifications. As might be expected, the worker classification that accumulated the greatest response was laborer.

In some instances, the research team directly contacted subcontractors in particular counties and requested entry level wages for selected trades for which the survey data was insufficient.

B. Prevailing Wage Rates

The estimation of the prevailing wage rate is based on reported per hour wages and applicable fringe benefits paid by the contractor (i.e., health, pension, and vacation). Since the prevailing wage is a minimum wage, and since there is considerable variation in reported wages within each job classification, the Survey Team adopted two strategies for providing realistic, statistically valid prevailing wages. First, for each job classification, we excluded supervisors, superintendents, and foremen, unless otherwise required for construction oversight. This strategy was implemented in order to obtain the wages for typical workers in each trade or job classification.

The second strategy involved using the mean or average as the estimate for the prevailing wage in each job classification. The mean or average is a statistical estimate of the wage for an "average" worker in a job classification.

The prevailing wage rates report may not apply (i.e., they may be too high) for some entry level apprentices or trainees with very little (or no) wage rates presented in Table A are not inclusive of all possible trades on a construction project. In each case, it is the responsibility of the Contractor to determine satisfactory prevailing wage rates for these situations.

C. Updating the Wage Rate Data Base

According to Texas Government Code, prevailing wages are valid for up to three years once adopted by Governing Board. Thus, the wages established herein will need to be periodically updated as deemed necessary. The Survey Team proposes the following recommendations to facilities the process for updating prevailing wages.

SOUTH TEXAS COLLEGE

Texas Building Construction Trades

Prevailing Wage Rates Determination

April 26, 2016

Code	Worker Classification	Prevailing Wage Rate
A-001	Carpenter	12.71
A-002	Flooring Installer	12.63
A-003	Concrete Finisher	11.10
A-004	Datacom/Telecom	13.17
A-005	Drywall/Ceiling Installer/Insulator	10.45
A-006	Electrician (Journeyman)	15.67
A-007	Electrician (Apprentice)	10.65
A-008	HVAC Mechanic	16.42
A-009	HVAC Mechanic (Helper)	11.80
A-010	Glazier	10.60
A-011	Heavy Equipmenrt Operator	12.75
A-012	Piping/Ductwork Insulator	11.61
A-013	Iron Worker	10.63
A-014	Laborer	8.98
A-015	Lather/Plasterer	11.00
A-016	Light Equipment Operator	10.95
A-017	Mason/Bricklayer	12.25
A-018	Pipefitter (Incl. Fire Protection)	15.21
A-019	Plumber (Journeyman/Master)	15.61
A-020	Plumber (Apprentice/Helper)	11.86
A-021	Roofer	10.25
A-022	Sheetmetal Worker	11.77
A-023	Tile Setter	15.38
A-024	Waterproofer	10.38
A-025	Painter (Brush, Roller and Sprayer)	13.17
A-026	Millwork	10.50

The optimal method for establishing statistically reliable and valid prevailing wages rates is to conduct a survey of actual wages paid for qualifying construction projects. The Survey Team has identified strategies that should expedite conducting future surveys.

The greatest challenges that the research team encountered in conducting this survey were lack of cooperation/ participation on the part of some contractors, and unavailability of data. If all contractors had been eager and willing to participate and had they produced complete payroll records for the projects that were solicited, this survey could have been completed with more information.

Recommendations for going forward include the following:

- South Texas College should consider obtaining written agreement from contractors to participate in future wage surveys. Language to that effect could be incorporated into construction contracts with contractors and their subcontractors.

- South Texas College should enforce the contract requirement for contractors to secure payroll data for projects. The payroll data should be easily accessible so that researchers may obtain the data in a timely manner, and it should be provided at the close of the project. This would require (or some other entity) to archive the records, however they would be readily accessible.

- WORKER WAGE RATE NOTIFICATION FORMS should be maintained for all craftsmen working on the project for the duration of the project. These forms should be provided to STC at the completion of the project. Consider standard form automation to load a predetermined project information database.

While the Texas Worforce Commission (TWC) data are extremely useful for benchmarking the survey, the TWC data are not sufficient for a local wage survey for two reasons. First, the TWC reports wages for a very limited number of job classifications. Second, the trades that are included in the TWC data base vary tremendously across counties, precluding the estimation of local wage rates based on state wide wage rates for all but a limited number of job classifications.

Table A – Description of Categories

Description of Categories		
Code	**Classification**	**Trade Description**
A-001	Carpenter	Builds wood structures and wood framing.
A-002	Flooring Installer	Lays carpet, rugs, and other flooring materials.
A-003	Concrete Finisher	Worker who floats, trowels and finishes concrete.
A-004	Datacom/Telecom	Lays out, assembles, installs and test apparatus, control equipment, etc.
A-005	Drywall/Ceiling Installer	Hangs gypsum board, sheathing and suspended acoustic tile ceiling; lays out work.
A-006	Electrician (Journeyman)	A master who lays out, assembles, installs and test electrical wiring, devices, and systems.
A-007	Electrician (Apprentice)	A learner who lays out, assembles, installs and test electrical wiring, devices, and systems.
A-008	Elevator Mechanic	Installs lays out elevators and componenetry.
A-009	Fire Proofing Installer	Installs fire proofing materials.
A-010	Glazier	Worker who installs glass, glazing and glass forming.
A-011	Heavy Equipment Operator	Operates heavy equipment used in engineering and construction projects.
A-012	Piping/Ductwork Insulator	Installs insulating materials upon duct and piping systems.
A-013	Iron Worker	Installs/erects/dismantles the structural steel framework of structural steel frame buildings.
A-014	Laborer	Traditionally considered unskilled manual labor.
A-015	Lather/Plasterer	Layout and installs lath and plaster.
A-016	Light Equipment Operator	Operates light equipment used in engineering and construction projects.
A-017	Mason/Bricklayer	Bricklayer/stonemason installing materials to construct or repair walls, partitions, arches, etc.
A-018	Pipefitter	Worker who installs hangers and piping systems.
A-019	Plumber (Journeyman)	A master person who installs and repairs the pipes and fittings of water supply, sanitation, or heating systems.
A-020	Plumber (Apprentice)	A learner who installs and repairs the pipes and fittings of water supply, sanitation, or heating systems.
A-021	Roofer	Worker who installs roofing materials, felts, flashings, membranes, etc.
A-022	Sheet Metal Worker	Fabricating structures, cutting, drilling, bending, rolling, punching and welding operations.
A-023	Tile Setter	Prepares bases, including waterproof membranes, metal lath and fasteners, back-up materials pertaining to tile, mixing use of cement motars.
A-024	Water Proofer	Installs materials for waterproofing.

NOTE:

1) If your category is not identified above please insert in blank space.

2) Information related to completion of this survey is CONFIDENTIAL and will used for internal use only.

Table B – Employee Pay Rates Form

Employee Pay Rates

FIRM NAME

COUNTY

TRADE CLASSIFICATION

Code	Classification	# of Employees	Hourly Wage Rate	Health & Welfare	Pension	Vacation	Total Fringes	Total Package
A-001	Carpenter						$ -	$ -
A-002	Flooring Installer							
A-003	Concrete Finisher							
A-004	Datacom/Telecom							
A-005	Drywall/Ceiling Installer							
A-006	Electrician (Journeyman)							
A-007	Electrician (Apprentice)							
A-008	Elevator Mechanic							
A-009	Fire Proofing Installer							
A-010	Glazier							
A-011	Heavy Equipment Operator							
A-012	Piping/Ductwork Insulator							
A-013	Iron Worker							
A-014	Laborer							
A-015	Lather/Plasterer							
A-016	Light Equipment Operator							
A-017	Mason/Bricklayer							
A-018	Pipefitter							
A-019	Plumber (Journeyman)							
A-020	Plumber (Apprentice)							
A-021	Roofer							
A-022	Sheet Metal Worker							
A-023	Tile Setter							
A-024	Water Proofer							

NOTE:

1) If your category is not identified above please insert in blank space.

2) Information related to completion of this survey is CONFIDENTIAL and will used for internal use only.

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HIDALGO COUNTY FRONT END SPECIFICATIONS

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HIDALGO COUNTY INTERLOCAL AGREEMENT
HIDALGO COUNTY WAGE RATE DETERMINATION INFORMATION

II. SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 11 00 – SUMMARY OF WORK
01 11 16 – OWNER PROVIDED DOCUMENTS
01 25 13 – PRODUCT SUBSTITUTION PROCEDURES
01 26 00 – CONTRACT MODIFICATION PROCEDURES
01 29 00 – PAYMENT PROCEDURES
01 29 73 – SCHEDULE OF VALUES
01 31 13 – PROJECT COORDINATION
01 31 19 – PROJECT MEETINGS
01 32 16 – CONSTRUCTION PROGRESS SCHEDULE
01 33 00 – SUBMITTAL PROCEDURES
01 35 16 – ALTERATION PROJECT PROCEDURES
01 41 00 – REGULATORY REQUIREMENTS
01 45 00 – QUALITY CONTROL
01 45 23 – TESTING AND INSPECTING SERVICES
01 50 00 – TEMPORARY FACILITIES AND CONTROLS
01 71 23 – FIELD ENGINEERING
01 73 29 – CUTTING AND PATCHING
01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 77 00 – CLOSEOUT PROCEDURES
01 78 39 – PROJECT RECORD DOCUMENTS

DIVISION 02 - EXISTING CONDITIONS

SECTION 02 32 00 – GEOTECHNICAL REPORT
02 41 13 – SELECTIVE DEMOLITION

DIVISION 03 - CONCRETE

SECTION 03 30 00 – CAST IN PLACE CONCRETE
03 31 00 – CONCRETE ACCESSORIES

DIVISION 4 - MASONRY

NONE

DIVISION 5 - METALS

SECTION 05 40 00 – COLD FORMED METAL FRAMING
05 50 00 – METAL FABRICATIONS
05 80 00 – EXPANSION CONTROL

DIVISION 6 - WOOD AND PLASTICS

SECTION 06 10 00 – ROUGH CARPENTRY
06 20 00 – FINISH CARPENTRY AND MILLWORK

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07 14 00 – WATERPROOF COATING
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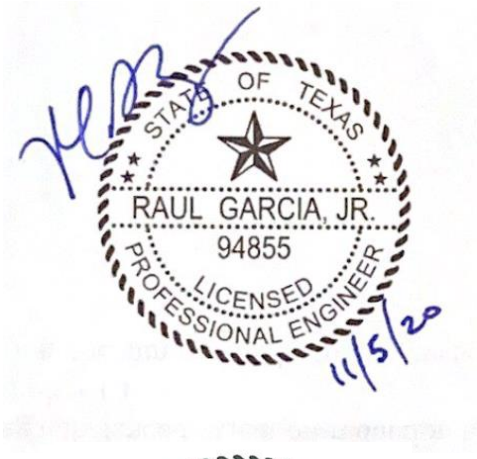
REFERENCE CIVIL SPECIFICATIONS

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HIDALGO COUNTY PRECINCT 1
SUNSET PARK OPERATIONS FACILITY

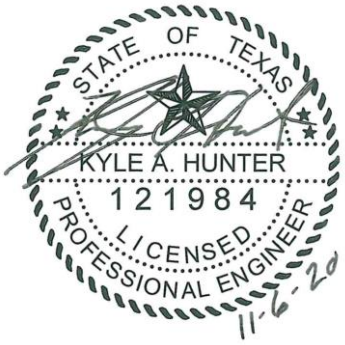
CIVIL ENGINEER:
HALFF ASSOCIATES, INC.
5000 WEST MILITARY, STE. 100
MCALLEN, TEXAS 78503
P: (956) 664-0286
F: (956) 664-0282

RAUL GARCIA JR, P.E.



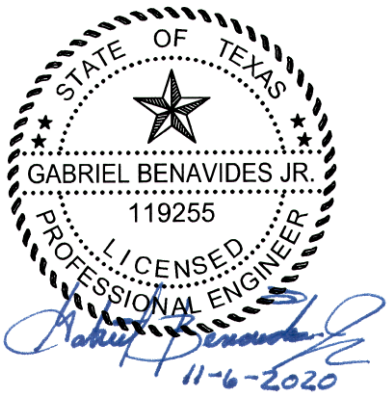
MECHANICAL ENGINEER:
HALFF ASSOCIATES, INC.
5000 WEST MILITARY, STE. 100
MCALLEN, TEXAS 78503
P: (956) 664-0286
F: (956) 664-0282

KYLE A. HUNTER, P.E.



ELECTRICAL ENGINEER:
HALFF ASSOCIATES, INC.
5000 WEST MILITARY, STE. 100
MCALLEN, TEXAS 78503
P: (956) 664-0286
F: (956) 664-0282

GABRIEL BENAVIDES, P.E.



ITS ENGINEER:
HALFF ASSOCIATES, INC.
5000 WEST MILITARY, STE. 100
MCALLEN, TEXAS 78503
P: (956) 664-0286
F: (956) 664-0282

JOSE A. DELGADO, P.E.



STRUCTURAL ENGINEER:
CHANIN ENGINEERING, LLC
400 NOLANA, SUITE H2
MCALLEN, TEXAS 78504
P: (956) 687-9421
F: (956) 687-3211

MIGUEL CHANIN, P.E.



11-06-2020

HIDALGO COUNTY PRECINCT 1
SUNSET PARK OPERATIONS FACILITY
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SECTION 01 11 00

SUMMARY OF WORK

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. THE PROJECT: A new Operations Facility of approximately 9,360 square feet will be constructed for Hidalgo County Precinct 1. The new Operations facility will house an administration area of approximately 5,000 square feet which will include offices, a dispatch area, safety area, break room, storage, and 4,360 square feet of a garage area with three bays which includes a locker area, parts storage, and a mechanic shop. Site work will include new parking for visitors and ADA requirements. All other parking for staff and county vehicles will be performed as a separate contract. New utilities, site drainage, grading will be performed as part of this contract.

B. PROJECT COMPONENTS:

1. ADMINISTRATION BUILDING AND SHOP – Will consist of a combination of pre-engineered metal building with pre-engineered metal roof, structural steel, with bar joists, built up modified bitumen roof, and concrete slab on grade. The administration area will be constructed of metal studs and split faced cmu veneer, and metal wall panels. A new concrete ramp, stairs, concrete flatwork for the building for ADA purposes and utilities will also be constructed around the site.

C. THE WORK:

1. All work or portions of work necessary to provide a complete in-place, weather tight, structural sound facility as represented in the Drawings and Specifications, including, but not limited to civil site work and utilities, architectural and structural building components, architectural finishes, mechanical equipment and ducting, plumbing piping and fixtures, electrical equipment and fixtures, fire alarm, security and communications.

1.2 CONTRACT DESCRIPTION

A. Perform Work of Contract under separate contract with Owner in accordance with the Conditions of the Contract, and as modified by Supplementary Conditions of the Contract.

1.3 CONTRACTS AND USE OF SITE

A. Contractor Use of Premises:

1. Confine operations at site to areas permitted by:
    a. Law
    b. Ordinances
    c. Permits
    d. Contract Documents
2. Do not unreasonably encumber site with materials or equipment.
3. Assume full responsibility for protection and safekeeping of products stored on premises.

4. Obtain and pay for use of additional storage or work areas as needed for operations.
5. Contractor shall establish secured staging area for work and coordinate and provide for safe passage and exit from building areas during construction, as determined by City and District officials.
6. Contractor shall coordinate all construction activities with Owner.
7. Owner reserves the right to perform construction operations with its own forces or to employ separate contractors on portions of the Project. Contractor shall coordinate with this work in terms of providing site access, work space, and storage space, cooperation of work forces, scheduling, and technical requirements.
8. Coordinate all utility shutdowns with Owner and, as required, with local utility companies, prior to commencement of shutdown.

B. Owner Occupancy:
1. Partial Owner Occupancy: The Owner reserves the right to place and install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
2. A Certificate of Substantial Completion will be executed in accordance with conditions of the Contract.
3. Contractor shall obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.
4. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.
5. Prior to partial Owner occupancy, emergency and life safety systems shall be fully operational. Emergency and life safety systems include, but are not limited to, fire sprinkler systems, fire alarm systems, and emergency egress devices. For emergency exiting purposes, the path of travel shall be clearly delineated and functional. If required, temporary barricades shall separate on-going construction from occupied spaces as allowed by the governing agency holding jurisdiction over the Project. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will provide operation and maintenance of emergency and life safety systems in occupied portions of the building.

C. Owner-Furnished Items:
1. The Owner may provide items to the Contractor for installation in accordance with manufacturer's recommendations and instructions.
2. The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule and will inspect deliveries for damage.
3. If Owner-furnished items are damaged, defective or missing, through no fault of the Contractor, the Owner will arrange for replacement.
4. The Contractor is responsible for designating the delivery dates of Owner-furnished items in the Contractor's Construction Schedule and for receiving, unloading and handling Owner-furnished items at the site. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to elements, and to repair or replace items damaged as a result of his operations.

D. Coordination with Owner's Forces or Owner's Contractors:
1. Provide site access, space allocation, scheduling, scheduling coordination, coordination of work forces and coordination of technical requirements with

contractors that may be selected and employed by Owner to perform work simultaneously and in conjunction with the Work, which may include, but shall not be limited to the following, as applicable to the Project:

a. Materials Inspection and Testing Agency
b. HVAC Testing, Adjusting, Balancing Agency
c. Energy Management System Contractor
d. Data and Cabling System Contractor
e. Telephone System Contractor
f. Modular Furniture Installer
g. Lighting and Sound
h. Surveying
i. Geotechnical Engineering and Consulting

E. The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage but only to the extent the Owner would be responsible for any such losses or damages under state and/or federal law.

F. The Architect will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract, except as noted in the above paragraph.

G. No demolition will be allowed above, below, adjacent to or near any occupied areas of the existing building.

1.4 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Architects/Engineers written responses to Minor Change directives, Change Proposal Requests, and other supplemental instructions.
5. Change Orders and other modifications to the Contract.
6. Reviewed Shop Drawings, Product Data, and Samples.
7. Manufacturer's instruction for assembly, installation, and adjusting.

B. Refer to section 01 78 39, Project Record Documents for additional information.

1.5 PROTECTION OF EXISTING PROPERTY

A. Contractor shall provide and maintain adequate protection of all Owners' existing property during duration of Project.

B. Contractor shall verify location of all existing underground pipelines on site with the owner of such pipelines and authorities having jurisdiction and shall provide and maintain adequate protection of all such pipelines during duration of Project.

C. Protection of Trees:
   1. Provide wood barricades around trees and shrubs at their drip line in traffic areas to protect them from construction operations until Substantial Completion, or until barricade removal is directed by Architect.

1.6 USE OF ASBESTOS FREE MATERIALS, PRODUCTS AND SYSTEMS

A. The Contractor is reminded to refer to Document AB, Instructions to Offerors for requirements regarding asbestos containing materials (ACM).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to Specification Sections.

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE

A. All work shall commence upon Notice to Proceed and all of the Work shall be Substantially Complete by **the Time negotiated in the Contract**.

B. Refer to Section 01 32 16 for other scheduling requirements, and to Document CB - Supplementary Conditions for information concerning Liquidated Damages.

C. Failure to achieve Substantial Completion will result in the General Contractor being assessed Liquidated Damages in the amount of **$500.00 per calendar day** until Substantial Completion is established.

D. Failure to achieve Close Out and Final Completion within 30 days of Substantial Completion will result in the General Contractor being assessed an additional penalty in the amount of **$500.00 per calendar day** until Close Out and Final Completion is established.

END OF SECTION

SECTION 01 11 16

OWNER PROVIDED DOCUMENTS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 COPIES OF SUPPLEMENTARY DOCUMENTS

A. The Owner has included the following supplementary documents for the Offerors information. The Owner does not guarantee the accuracy of this information and the Offerors should verify the existing conditions prior to the Proposal date.

1. Geotechnical Engineering Study: Millennium Engineers Group (MEG), Inc.
   a. Entitled: Geotechnical Site Assessment
   b. Prepared for: County of Hidalgo
   c. Prepared by: Millennium Engineers Group (MEG), Inc.
   d. Project No.: 01-19-29117
   e. Dated: March 08, 2019

2. Site Survey:
   a. Entitled: G0.03 – Survey
   b. Prepared by: Halff Associates, Inc.

B. The Architect does not guarantee their contents as to accuracy, completeness, or suitability.

C. The boring logs, Geotechnical Study and Supplementary Recommendations from the above-mentioned soils report are included in Section 02 32 00 – Geotechnical Investigations.

D. The site survey is included in the Drawings, Sheets G0.03

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Specified product compliance, and product quality assurance

B. Specific administrative and procedural requirements for handling requests for substitutions made prior to award of Contract.

C. Requirements for product delivery, storage and handling.

1.2 RELATED REQUIREMENTS

A. Instructions to Offerors: Product options and procedures for submittal of requests for substitutions during the Proposal period.

1.3 DESCRIPTION OF REQUIREMENTS

A. Definitions: Definitions used in this Section are not intended to negate the meaning of other terms used in the Contract Documents, including such terms as “specialties”, “systems”, “structure”, “finishes”, “accessories”, “furnishings”, “special construction”, and similar terms. Such terms are self-explanatory and have recognized meanings in the construction industry.
   1. Products: Shall mean items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the project or taken from the Contractor’s previously purchased stock. The term “product” as used herein includes the terms “material”, “equipment”, “system”, and other terms of similar intent.
      a. Named Products: Are those identified by the use of the manufacturer’s name for a product, including such items as a make or model designation, as recorded in published product literature, of the latest issue as of the date of the Contract Documents.
      b. Specified Products: same as Named Products.
   2. Materials: Shall mean products that must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form units of work.
   3. Equipment: Is defined as a product with operational parts, regardless of whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.

1.4 PRODUCT QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.
   1. When it is discovered that specific products are available only from sources that do not or cannot produce an adequate quantity to complete project requirements in a timely manner, consult with the Architect/Engineer for a determination of what product quantities are most important before proceeding. The

Architect/Engineer will designate those qualities, such as visual, structural, durability, or compatibility, that are most important. When the Architect/Engineer's determination has been made, select products from those sources that produce products that possess the most important qualities, to the fullest extent possible.

B. Compatibility of Options: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two (2) or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract Documents but must be provided by the Contractor.

C. Or Equal:
1. Where the phrase "or equal", "or equivalent", "or Architects approved equal", or similar phrasing, occurs in the Proposal Documents, do not assume that materials, equipment, or methods of construction will be approved by the Architect unless the item has been specifically approved for this Work by the Architect.
2. The decision of the Architect shall be final.

D. Where a proposed substitution involves the work of more than one (1) contractor, each contractor involved shall cooperate and coordinate the work with each other contractor involved, so as to provide uniformity and consistency and to assure the compatibility of products.

E. Foreign Product Limitations: "Foreign products" as distinguished from "domestic products" are defined as products that are either manufactured substantially (50 percent or more of value) outside of the United States and its possessions, or produced or supplied by entities known to be substantially owned (more than 50 percent) by persons who are not citizens of nor living within the United States and its possessions.
1. Except under one (1) of the following conditions, select and provide domestic, not foreign, products for inclusion in the Work.
   a. There is no domestic product available that complies with the requirements of the Contract Documents.
   b. Available domestic products that comply with the requirements of the Contract Documents are available only at prices or other procurement terms that are substantially higher (25 percent or more) than for available foreign products that comply with the requirements of the Contract Documents.
   c. At the discretion of the Architect or Owner.
2. Final determination and acceptance will be the responsibility of the Architect.

F. Standards: Refer to Section 01 41 00, Regulatory Requirements for the applicability of industry standards to the products specified for the Project, and for the acronyms used in the text of the Specification Sections.

1.5 SUBSTITUTIONS OF PRODUCTS

A. The products described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. The materials and equipment named in, and the procedures covered by these specifications have been selected as a standard because of quality, particular suitability or record of

satisfactory performance. It is not intended to preclude the use of equal or better materials or equipment provided that same meets the requirements of the particular project and is approved in an Addendum as a substitution prior to the submission of proposals.

B. No substitution will be considered prior to receipt of proposals unless written request for approval has been received by the Architect at least seven (7) days prior to the date for receipt of proposals. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

C. If the Architect approves any proposed substitution prior to receipt of proposals, such approval will be set forth in an Addendum. Offerors shall not rely upon approvals made in any other manner.

D. The Architect and Owner reserve the right to disapprove the use of any manufacturer who in their judgment is unsuitable for use on the Project and that decision will be final

E. The following are not considered as substitutions:
1. Revisions to the Contract Documents, when requested by the Owner, Architect, or any of their consultants are considered as “changes” not substitutions.
2. Specified Contractor options on products and construction methods included in Contract Documents are choices made available to the Contractor and are not subject to the requirements specified in this Section for substitutions.
3. Except as otherwise provided in the Contract Documents, the Contractor’s determination of and compliance with governing authorities do not constitute “substitutions” and do not constitute a basis for change orders.

F. The following may be considered as a reason for a request for substitution:
1. The request is directly related to an “or approved equal” clause or similar language in the Contract Documents.
2. The specified product or method of construction cannot be provided within the Contract Time in accordance with paragraph below concerning availability of specified items.
3. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
4. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other consideration of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Architect/Engineer for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
5. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
6. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
7. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

G. Availability of specified items:
1. Verify prior to submittal of Proposal that all specified items will be available in time for installation during orderly and timely progress of the work.
2. In the event specified items will not be so available, notify the Architect prior to receipt of Proposals. Submit Request for Substitutions in accordance with this section.
3. The request will not be considered if the product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly or coordinate activities properly.
4. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back-charged as necessary and shall not be borne by the Owner.

H. A request constitutes a representation that Offeror:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product, except when inability to provide specified Warranty is reason for request for substitution as described above.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse the Owner and pay for all costs, including Architect/Engineer's redesign and evaluation costs resulting from the use of the proposed substitution, or for review or redesign services associated with re-approval by authorities having jurisdiction.

I. **No substitutions will be considered after the Award of Contract.**

1.6 SUBSTITUTION REQUEST SUBMITTAL

A. Requests for Substitutions: Submit three (3) copies of each request for substitution. In each request identify the product or fabrication or installation method to be replaced by the substitution; include related Specifications Section and Drawing numbers, and complete documentation showing compliance with the requirements for substitutions. Include, as appropriate, with each request, the following information:
1. Product data, drawings and descriptions of products, fabrication and installation procedures.
2. Samples, where applicable or requested.
3. A detailed comparison of the significant qualities of the proposed substitution with those of the work originally specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect, where applicable.
4. Coordination information, including a list of changes or modifications needed by other parts of the work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
5. A statement indicating the effect the substitution will have on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
6. Cost information, including a proposal of the net change, if any in the Contract Sum.

7. Certification by the Contractor to the effect that, in the Contractor's opinion, after thorough evaluation, the proposed substitution will result in work that in every significant respect is equal-to or better than the work required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
8. A statement indicating the Contractor will reimburse the Owner and pay for all costs, including Architect/Engineer's re-design and evaluation costs resulting from the use of the proposed substitution.

B. Work-Related Submittals: The Contractor's submittal of, and the Architect/Engineer's acceptance of, Shop Drawings, Product Data, or Samples which are related to work not complying with the Contract Documents, does not constitute an acceptance or valid request for a substitution, nor approval thereof.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control to prevent overcrowding of construction spaces or overloading of structure. In particular, coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.
1. Deliver products to the site in the manufacturer's sealed containers or other packaging system, complete with labels intact, and instructions for handling, storage, unpacking, installing, cleaning and protecting.
2. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of product.
3. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
4. Store products at the site or in a bonded and insured off-site storage facility or warehouse in a manner that will facilitate inspection and measurement of quantity or counting of units. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
5. Store heavy materials away from the project structure or in a manner that will not endanger the supporting construction.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT COMPLIANCE

A. General: Requirements for individual products are indicated in the Contract Documents; compliance with these requirements is in itself a contract requirement. These requirements may be specified in any one (1) of several different specifying methods, or in any combination of these methods. These methods include the following:
1. Proprietary
2. Descriptive
3. Performance
4. Compliance with Reference Standards

Compliance with codes, compliance with graphic details, allowances, and similar provisions of the Contract Documents also have a bearing on the selection process.

B. Procedures for Selecting Products: The Contractor's options in selecting products are limited by requirements of the Contract Documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects. Required procedures include, but are not limited to the following for the various indicated methods of specifying:

1. Proprietary and Semi-Proprietary Specification Requirements:
   a. Single Product Name: Where only a single product or manufacturer is named, provide the product indicated, unless the specification indicates the possible consideration of other products. Advise the Architect/Engineer before proceeding, when it is discovered that the named product is not a reasonable or feasible solution.
   b. Two (2) or More Product Names: Where two (2) or more products or manufacturers are named, provide one (1) of the products named, at the Contractor's option. Exclude products that do not comply with specification requirements. Do not provide or offer to provide an unnamed product, unless the specification indicates the possible consideration of other products. Advise the Architect/Engineer before proceeding where none of the named products comply with specification requirements or are not feasible for use. Where products or manufacturers are specified by name, accompanied by the term "or approved equal" or similar language, comply with this Section regarding "substitutions" to obtain approval from the Architect/Engineer for the use of an unnamed product.
2. Non-Proprietary Specification Requirements: Where the specifications name products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to the use of these products only, the Contractor may, at his option, use any available product that complies with the Contract requirements.
3. Descriptive Specification Requirements: Where the specifications describe a product or assembly generically, in detail, listing the exact characteristics required, but without use of a brand name, provide products or assemblies that provide the characteristics indicated and otherwise comply with Contract requirements.
4. Performance Specification Requirements: Where the specifications require compliance with indicated performance requirements, provide products that comply with the specific performance requirements indicated, and that are recommended by the manufacturer for the application indicated. The manufacturer's recommendations may be contained in published product literature, or by the manufacturer's individual certification of performance. General overall performance of a product is implied where the product is specified for specific performances.
5. Compliance with Standards, Codes, and Regulations: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of selecting a product that complies with specification requirements, including standards, codes, and regulations.
6. Visual Matching: Where matching an established sample is required, the final judgement of whether a product proposed by the Contractor matches the sample satisfactorily will be determined by the Architect. Where there is no product available within the specified product category that matches the sample satisfactorily and also complies with other specified requirements, comply with the provisions of this Section regarding "substitutions" and other Contract Documents for "change orders" for the selection of a matching product in another product category, or for non-compliance with specified requirements.

7. Visual Selection: Except as otherwise indicated, where specified product requirements include the phrase "…as selected from the manufacturer's standard colors, patterns, textures…" or similar phrases, the Contractor has the option of selecting the product and manufacturer, provided the selection complies with other specified requirements. The Architect is subsequently responsible for selecting the color, pattern and texture from the product line selected by the Contractor.
8. Allowances: Refer to individual sections of the specifications and Section 01 21 00, Allowances for an indication of product selections that are controlled by established allowances, and for the procedures required for processing such selections.

C. Producer's Statement of Applicability: Where individual specification sections indicate products that require a "Statement of Applicability" from the manufacturer or other producer, submit a written-certified statement from the producer stating that the producer has reviewed the proposed application of the product on the project. This statement shall state that the producer agrees with or does not object to the Architect/Engineer's specification and the Contractor's selection of the product on the project is suitable and proper.

2.2 SUBSTITUTIONS

A. Condition: The Contractor's request for substitution will be received and considered when extensive revisions to Contract Documents are not required, when the proposed changes are in keeping with the general intent of the Contract Documents, when the request is timely, fully documented and properly submitted, and when one (1) or more of the above conditions are satisfied, all as judged and determined by the Architect/Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. General: Except as otherwise indicated in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated.

B. Anchor each product securely in place, accurately located and aligned with other work.

C. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.

D. Products and assemblies shall be installed complete, in-place, watertight and structurally sound.

3.2 INSTALLATION OF APPROVED SUBSTITUTIONS

A. Coordinate all approved substitutions with adjacent work.

B. Comply with the manufacturer's and/or supplier's instructions and recommendations for installation of the products in the applications indicated.

C. Provide all items required by manufacturer and/or supplier regarding installation, i.e. supplemental supports, anchors, fasteners, painting, etc. whether or not indicated or specified.

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Change procedures.
B. Defect assessment.

1.2 GENERAL

A. Coordinate requirements of this Section with the requirements of the General and Supplementary Conditions of the Contract concerning change procedures.

1.3 CHANGE PROCEDURES

A. Submittals: Submit name of individual authorized to receive change documents and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Minor Changes: The Architect/Engineer may advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on Minor Change form or by other similar documents in the form issued by the Architect.

C. Change Proposal Request: The Architect may issue a Change Proposal Request (CPR) or other similar request for proposal in the form issued by the Architect, including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate in the form of a Change Proposal so as to not cause delays in the Project.

D. Use of allowances must be approved by issuance of Allowance Expenditure Authorization (AEA) by Architect prior to modification of the schedule of values. The AEA may be comprised of a single executed Change Proposal, an accumulation of executed Change Proposals, or other similar documentation in the form allowed by the Architect in accordance with Document CB, Supplementary Conditions of the Contract.

E. Contractor may propose changes which, in his opinion, will provide value to the Owner, by submitting a request for change to Architect, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. If accepted by Architect and approved by Owner, submit a Change Order in accordance with the requirements of this Section. This request will not be considered a substitution except as defined by Section 01 25 13, Product Substitution Procedures. Owner is not obligated to accept this request.

F. Construction Change Directive: Architect/Engineer may issue directive, on AIA Form G713 Construction Change Directive or other similar document in the form issued by the

Architect, and signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

G. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.

H. Change Order Forms: AIA G701 - Change Order.

I. Execution of Change Orders: The Architect will prepare and sign the Change Order, the contractor shall sign the Change Order indicating acceptance of the change, and then the Owner will execute the Change Order.

J. Correlation Of Contractor Submittals:
1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
3. Promptly enter changes in Project Record Documents.

1.4 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements at no additional cost to the Owner.

B. If, in the opinion of the Architect/Engineer or Owner, it is not practical to remove and replace the Work, the Architect will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but sum/price will be adjusted to new sum/price at the discretion of Architect or Owner.

D. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

E. Authority of Architect/Engineer, or other appropriate agent identified to perform assessment by the Architect/Engineer or Owner, to assess defects and identify payment adjustments, is final.

F. Non-Payment For Rejected Products: In addition to replacement of rejected Work, payment will not be made for rejected products for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from transporting vehicle.
4. Products placed beyond lines and levels of required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected products.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedures for submitting Applications for Payment.

1.2 GENERAL

A. Coordinate requirements of this Section with the requirements of the General and Supplementary Conditions of the Contract concerning payment procedures.

1.3 SCHEDULE OF VALUES

A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702 in accordance with Section 01 29 73, Schedule of Values. Contractor's standard form or electronic media printout will be considered but must be approved by the Owner.

1.4 APPLICATIONS FOR PAYMENT

A. Submit four (4) notarized originals of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702 or other similar form approved by the Owner.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Payment Period: Submit at intervals stipulated in the Agreement in accordance with Document CB, Supplementary Conditions of the Contract.

E. Only materials stored on the project site shall be paid for unless the materials are stored in a bonded warehouse.

F. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Items which may be requested by the Architect or Owner to substantiate costs include, but are not limited to the following:
   1. Current Record Documents as specified in Section 01 77 00, Closeout Procedures, for review by Owner which will be returned to Contractor.
   2. Labor time sheets, purchase orders, or similar documentation.
   3. Affidavits attesting to off-site stored products.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

SECTION 01 29 73

SCHEDULE OF VALUES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the work, as specified herein and in other provisions of the Contract Documents.

B. Coordinate requirements of this Section with the requirements of the General and Supplementary Conditions of the Contract concerning Schedule of Values.

1.2 QUALITY ASSURANCE

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so required by the Owner, provide copies of the subcontracts or other data acceptable to the Owner, substantiating the sums described.

1.3 SUBMITTALS

A. Prior to the first Application for Payment, submit a proposed schedule of values to the Owner, as outlined below:
   1. Meet with the Owner and determine additional data, if any, required to be submitted.
   2. Secure the Owner's approval of the schedule of values prior to submitting first Application for Payment.

1.4 SCHEDULE OF VALUES

A. The Schedule of Values shall be broken down into item costs for each specification section as a minimum. After review by the Owner, the Schedule of Values shall be broken down into further items as required. (See following list and refer to the enclosed sample.). In addition, total each Specification Division separately.

B. Schedule of Values - Items in addition to Specification Sections.
   1. Mobilization
   2. Clean Up
   3. Building Permit
   4. Bonds, Insurance
   5. Misc. Mechanical Accessories
   6. Demolition
   7. Rough-In Labor - (Electrical)
   8. Rough-In Material - (Electrical)
   9. Finish Labor - (Electrical)
   10. Finish Material - (Electrical)
   11. Allowances (listed separately)
   12. Record drawings and close-out documents
   13. Submittals listed separately per mechanical, electrical and plumbing

14. Roof warranty as a line item
15. Donated items individually itemized at $0.00 (zero dollars).

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SCHEDULE OF VALUES

A. Refer to following sample.

END OF SECTION

SECTION 01 29 73

SCHEDULE OF VALUES - SAMPLE

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Div. 1 - General Reqs.								
	Site Work General Conditions								
	Suoervision								
	Mobilization								
	Bonds & Insurance								
	Permits								
	Contractor's Fee								
	Close-Out Documents								
	Div. 1 - Total								
	Div. 2 - Sitework								
	Demolition (As applicable)								
	Erosion Control								
	Site Clearing & Grubbing								
	Building Pad - Materials								
	Building Pad - Labor								
	Paving Subgrade								
	Signage / Striping								
	Bike Racks								
	Landscaping - Materials								
	Landscaping - Labor								
	Hydro Mulch - Materials								
	Hydro Mulch - Labor								
	Irrigation - Materials								
	Irrigation - Labor								
	Earthwork								
	Finish Grading								
	Stabilization - Materials								
	Stabilization - Labor								
	Site Drainage - Materials								
	Site Drainage - Labor								
	Chain Link Fence-Materials								
	Chain Link Fence-Labor								
	Paving - Labor								
	Paving - Materials								
	Sidewalks								
	Close-Out Documents								
	Div. 2 - Total								
	Div. 3 - Concrete								
	Drill Piers								
	Caps & Beams								
	Slab on Grade								
	Cooling Tower Basin								
	Misc Bldg Conc								
	Floor Sealer								
	Rebar Matl								
	Rebar Labor								
	Lt.Wt.Insul Fill - Materials								
	Lt.Wt.Insul Fill - Labor								
	Close-Out Documents								
	Div. 3 - Total								

SCHEDULE OF VALUES - SAMPLE

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Div 4 - Masonry Brickwork - Labor Brickwork - Matls Concrete Masonry - Labor Concrete Masonry - Materials Str. Glazed Tile-Labor Str. Glazed Tile-Materials Close-Out Documents								
	Div. 4 - Total								
	Div 5 - Metals Structural Steel - Labor Structural Steel - Materials Alternating Stairs Misc. Steel - Materials Steel Joists - Materials Lt. Gauge Steel Framing-Labor Lt. Gauge Steel Framing-Matls Metal Decking - Labor Expansion Joint Covers Metal Decking - Matls Close-Out Documents								
	Div. 5 - Total								
	Div. 6 - Wood & Plastics Rough Carpentry - Labor Rough Carpentry - Materials Millwork - Labor Millwork - Materials Close-Out Documents								
	Div. 6 - Total								
	Div. 7 - Thermal and Moisture Protection Waterpfng / Dampprfng-Matls Waterpfng / Dampprfng-Labor Building Insulation - Labor Building Insulation - Materials Fireproofing - Labor Fireproofing - Materials Metal Roof - Labor Metal Roof - Materials Metal Roof Guarantee Built-up Roofing-Labor Built-up Roofing-Materials Built-up Roofing Guarantee Roof Accessories Building Sheet Metal - Labor Building Sheet Metal - Matls Bldg. Sheet Metal Guarantee Roof Curbs Roof Hatches Sealants Close-Out Documents								
	Div. 7 - Total								

SCHEDULE OF VALUES - SAMPLE

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Div. 8 - Doors and Frames								
	Finish Carpentry/Door - Labor								
	Finish Hardware - Matls								
	Thresholds & Seals - Matls+B66								
	Hollow Metal Doors & Frames - Matls								
	Plastic Faced Doors-Matls								
	Overhead Doors & Grilles-Labor								
	Overhead Doors & Grilles - Matls								
	Alum. Entrances & Store-fronts - Labor								
	Alum. Entrances & Store-fronts - Matls								
	Alum. Windows - Labor								
	Alum Windows - Matls								
	Glass & Glazing-Labor								
	Glass & Glazing-Matls								
	Close-Out Documents								
	Div. 8 - Total								
	Div. 9 - Finishes								
	Lath & Plaster-Labor								
	Lath & Plaster-Matls								
	Gypsum Wallboard Systems - Labor								
	Gypsum Wallboard Systems - Matls								
	Ceramic Tile - Labor								
	Ceramic Tile - Matls								
	Quarry Tile - Labor								
	Quarry Tile - Matls								
	Terrazzo-Labor								
	Terrazzo-Matls								
	Acoustic Clg. - Labor								
	Acoustic Clg. - Matls								
	Acoustic Wall Panels								
	Resilient Flooring - Labor								
	Resilient Flooring - Matls								
	Carpet - Labor								
	Carpet - Matls								
	Athletic Flooring - Materials								
	Athletic Flooring - Labor								
	Floor Sealer								
	Painting - Labor								
	Painting - Mtls								
	Close-Out Documents								
	Div. 9 - Total								

SCHEDULE OF VALUES - SAMPLE

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Div. 10 - Specialties Visual Display Boards & Tackboards - Materials Visual Display Boards & Tackboards - Labor Toilet Partitions - Labor Toilet Partitions - Matls Louvers Aluminum Flag Pole Graphics Lockers Cubicle Curtains & Track Fire Extinguisher Cabinets Demountable Partitions-Labor Demountable Partitions-Matls Shelving Toilet Room Accessories-Matls Toilet Room Accessories-Lbr Close-Out Documents								
	Div. 10 - Total								
	Div. 11 - Equipment Stage Curtains Misc. Appliances Food Service Eqpt-Labor Food Service Eqpt-Matls Close-Out Documents								
	Div. 11 - Total								
	Div. 12 - Furnishings Horizontal Blinds Projection Screens Casework - Labor Casework - Matls Science Casework - Labor Science Casework - Matls Close-Out Documents								
	Div. 12 - Total								
	Div. 13 - Specialties Stage Curtains and Draperies Music Instrument Storage Bleachers Press Box Pre-eng. Metal Bldg. Stadium Seating Close-Out Documents								
	Div. 13 - Total								
	Div. 14 - Conveying Systems Platform Lifts Elevators Close-Out Documents								
	Div. 14 - Total								

SCHEDULE OF VALUES - SAMPLE

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Div. 15 - Plumbing								
	Shop Drawings								
	As-Builts/Close-Out/ O&M Manuals								
	Sanitary Underground - Labor								
	Sanitary Underground - Matls								
	Storm Underground - Labor								
	Storm Underground - Matls								
	Domestic Water - Labor								
	Domestic Water - Matls								
	Plumbing Insulation - Matls								
	Plumbing Insulation - Labor								
	Gas Piping - Matls								
	Gas Piping - Labor								
	Grease Trap								
	Plumbing Fixtures - Matls								
	Plumbing Fixtures - Labor								
	Coordination Drawings								
	Close-Out Documents								
	Div. 15 Plumbing - Total								
	Div. 15 - Mechanical								
	Shop Drawings								
	As-Builts/Close-Out/ O&M Manuals								
	Chillers - Matls								
	Chillers - Labor								
	Cooling Towers - Matls								
	Cooling Towers - Labor								
	Boilers - Matls								
	Boilers - Labor								
	AHU's - Matls								
	AHU's - Labor								
	Fans - Matls								
	Fans - Labor								
	Grilles - Matls								
	Grilles - Labor								
	Ductwork - Matls								
	Ductwork - Labor								
	Pumps - Mtls								
	Pumps - Labor								
	Water Treatment - Labor								
	Water Treatment - Matls								
	Isolation - Labor								
	Isolation - Matls								
	Pipe Flex - Matls								
	Pipe Flex - Labor								
	Connections								
	Sheet Metal - Matls								
	Sheet Metal - Labor								
	Duct Insulation - Matls								
	Duct Insulation - Labor								

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Pipe Insulation - Matls								
	Pipe Insulation - Labor								
	VAV Boxes - Materials								
	VAV Boxes - Labor								
	Refrigerant Monitor - Matls								
	Refrigerant Monitor - Labor								
	Unit Heaters - Materials								
	Unit Heaters - Labor								
	Startup								
	Controls - Matls								
	Control - Labor								
	Engineer / Submittals								
	Modules / End Devices								
	Low Voltage Wiring								
	Startup								
	Close-Out Documents								
	Fire Sprinkler								
	Engineer / Submittals								
	Piping - Materials								
	Piping - Labor								
	Equipment - Materials								
	Equipment - Labor								
	Trimout - Materials								
	Trimout - Labor								
	Pipe, Valves, Fittings - Labor								
	Pipe, Valves, Fittings - Matls								
	Misc. - Matls								
	Insulation - Matls								
	Insulation - Labor								
	Sanitary Above Slab-Labor								
	Sanitary Above Slab-Matls								
	Storm Above Slab - Labor								
	Storm Above Slab - Matls								
	Gas - Labor								
	Gas - Matls								
	Fixtures - Labor								
	Fixtures - Matls								
	Permits								
	Coordination Drawings								
	Close-Out Documents								
	Div. 15 Mechanical - Total								
	Div. 16 - Electrical								
	Mobilization+B220								
	Shop Drawings								
	As-Builts/Close-Out/ O&M Manuals								
	Underground								
	Conduit - Labor								
	Conduit - Matl								
	Wire - Labor								
	Wire - Matls								
	Feeder Wire - Labor								
	Feeder Wire - Matls								
	Switches/Recpt.								
	Switchgear - Labor								

SECTION 01 29 73

SCHEDULE OF VALUES - SAMPLE

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Switchgear - Matls Temporary - Materials Temporary - Labor Gas Generator - Materials Gas Generator - Labor Fixtures - Labor Fixtures - Matls Communications - Labor Communications - Matls Fire Alarm - Labor Fire Alarm - Matls Security - Labor Security - Matls Low Voltage Ltng Sys-Matls Low Voltage Ltng Sys-Labor Voice System - Materials Voice System - Labor Video System - Materials Video System - Labor Data System - Materials Data System - Labor Master Clock - Materials Master Clock - Labor+B277 Coordination Drawings Close-Out Documents								
	Div. 16 - Total								
	General Conditions Mobilization Temp. Facilities Final Cleaning Record Documents/Close-out/ O&M Manuals Supervision Permits Bonds Insurance Allowances Alternates (list) Change Orders A. PR# B. PR# C. PR#								

END OF SECTION

SECTION 01 31 13

PROJECT COORDINATION

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 REQUIREMENTS

A. General: notify the Architect whenever there is need of clarification or interpretation of the Contract Documents prior to commencement of work.

B. Commencement of work without Architect's prior notification means Contractor's acceptance of responsibility.

C. Commencement of work without Architect's prior notification implies Contractor's understanding of conditions, assemblies, methods, or procedures.

D. The project superintendent shall notify the Owner on an ongoing basis of ongoing work.

1.2 PRE-INSTALLATION CONFERENCE

A. General: Notify the Architect 48 hours in advance of certain stages of construction, and, as required by the Architect, organize a pre-installation meeting with each trade individually prior to commencement of their portion of the Work. At a minimum, representatives of the Architect, the General Contractor's project superintendent, and the Sub-contractor's Foreman and Project Manager shall be present at each meeting. The Engineer shall be notified as applicable.

B. As indicated in each specific section of this Project Manual, or as required by the Architect, these stages generally include, but are not necessarily limited to the following:
1. Division 3 - Installation of light weight concrete.
2. 03 30 00 - Excavation of grade beams.
3. 03 30 00 - Installation of concrete underlayment, vapor barriers, under slab water proofing
4. 03 30 00 - Placing of reinforcing, formwork, and concrete.
5. Division 4 - Block, brick, and stone placement, glass unit masonry, masonry cleaning.
6. 04 20 00 - Placing of masonry, grout, and reinforcement.
7. Division 5 - Erection of structural steel, open web steel joists, and steel deck.
8. 05 50 00 - Miscellaneous metals, ladders, brackets, pipe rails, etc.
9. Division 6 - Finish Carpentry and Millwork
10. Division 7 - installation of waterproofing, vapor barriers, flashing and sheet metal.
11. Division 7 - Installation of roofing system(s) and associated work.
12. 07 21 00 - Concealment of insulation.
13. 07 81 00 - Application of fireproofing.
14. 07 84 00 - Installation of firestopping and fire safing.
15. 07 92 00 - Installation of building and glazing sealants.
16. Division 8 - Installation of doors, frames, windows, and storefronts.
17. Division 8 - Installation of rolling and coiling doors and grilles.
18. 08 71 00 - Installation of finish hardware
19. 08 80 00 - Installation of glazing and glazed systems
20. Division 9 - Installation of plaster and gypsum board products.
21. Division 9 - Installation of tile, flooring, and pavers.

22. 09 51 00 - Installation of acoustical ceiling (grid and panels).
23. 09 65 19 - Installation of resilient flooring and base.
24. 09 91 00 - Painting and staining (each coat).
25. Division 10 - Installation of specialty items, marker boards, display cases, projection screens, signage and graphics, canopies.
26. Division 10 - Installation of operable walls and folding partitions.
27. 10 28 13 - Installation of toilet accessories.
28. Division 11 - Installation of appliances.
29. Division 12 - Installation of Horizontal Blinds.
30. Division 1 - Specialty construction items, metal buildings.
31. Divisions 22, 23 and 26 - Completion of roughing-in of plumbing, heating, air conditioning and electrical work (prior to concealment).
32. Division 22 - Installation of plumbing fixtures.
33. Division 23 - Installation of heating, ventilating and air conditioning.
34. Division 26 - Installation of all electrical fixtures.
35. Divisions 22, 23 and 26 - Any and all testing specified for equipment, mechanical, electrical and plumbing systems.
36. Division 32 - Installation of site amenities, fencing, surfaces, landscaping, etc.
37. 31 00 00 - Clearing and stripping of top soil within limits of grading.
38. 31 00 00 - (Excavation and) Placing (of each lift of) select fill material, and site grading.
39. 31 00 00, 31 23 23.13, 02720, and Divisions 22, 23 and 26 - Compaction, inspection, testing, and covering of underground utilities.
40. 31 63 29 - Drilling foundation piers.

C. In addition to notifying the Architect, notify the Structural Engineer (48 hours) prior to the following stages:
   1. Drilling, reinforcing, and placing of first piers and footings.
   2. Placing first reinforcing and grade beams.
   3. Erecting structural steel elements.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION CONFERENCE

A. The Contractor shall contact Architect at least ten (10) days prior to commencing construction in order for Architect to schedule a pre-construction meeting with Contractor, Architect, and Owner. This meeting must occur prior to commencement of any construction.

3.2 CONFERENCES AND MEETINGS

A. Refer to Section 01 31 19, Project Meetings for requirements pertaining to Pre-construction Conference, Progress Meetings, and Pre-installation Conferences.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. The Architect's:
1. Scheduling of each meeting (pre-construction meeting, periodic project meetings, and specialty called meetings throughout the progress of the Work).
2. Preparation of agenda for meetings.
3. Presiding at minutes, including all significant proceedings and decisions.
4. Recording, reproducing, and distributing copies of meeting minutes within two (2) working days, excluding weekends and holidays, after each meeting to:
   a. All participants in the meeting.
   b. All parties affected by decisions made at the meeting.
5. Providing status report of allowance funds.

B. The Contractor's:
1. Making physical arrangement for meetings.
2. Participation in all meetings and conferences.
3. Scheduling attendance of Job Superintendent, Project Coordinator, and other parties affecting or affected by decisions made at meetings and conferences as their interests require.
4. Scheduling Pre-installation conferences.
5. Scheduling Pre-Closeout Meeting
6. Providing updated schedules.
7. Providing status reports/logs of CPRs, MCs, and shop drawings/submittals.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION CONFERENCE

A. Contractor shall contact Architect at least ten (10) days prior to commencing construction in order for Architect to schedule a pre-construction meeting with Contractor, Architect, and Owner. This meeting must occur prior to commencement of any construction.

B. Architect will:
1. Administer pre-construction conference for the establishment of communication methods, procedures and Owner requirements.
2. Administer site mobilization conference for clarification of Owner and Contractor.

C. Location: At Project site as designated by the Architect.

D. Attendance:
1. General Contractor or Contractor's Representative
2. Job Superintendent

3. Project Coordinator (Project Manager)
4. Owner or Owner's Representative
5. Major subcontractors
6. Major suppliers
7. Architect's Representative
8. Architect's Field Representative
9. Consultants as needed
10. Others as appropriate

D. Meeting Agenda, may include, but is not limited to:
1. Discussion on major subcontracts and suppliers and projected construction schedules.
2. Critical work sequencing.
3. Major equipment deliveries and priorities. Discussion of long lead time items.
4. Project coordination and designation of responsible personnel.
5. Procedures and processing of field decisions, proposal requests, submittals, minor changes, change orders and applications for payment.
6. Method of distribution of Contract Documents.
7. Procedures for maintaining Record Documents.
8. Use of premises, office work and storage areas, on-site parking, and Owner's requirements.
9. Construction facilities and temporary utilities.
10. Housekeeping procedures.

3.2 PROGRESS MEETINGS

A. Architect will:
1. Schedule project meetings throughout progress of the work at weekly intervals, and specially called meetings.
2. Set agenda and administer said meetings.
3. Preside at meetings.
4. Record meeting minutes, including all significant proceedings and decisions.
5. Reproduce and distribute copies of meeting minutes within two (2) working days, excluding weekends and holidays, after each meeting to:
a. All participants in the meeting.
b. All parties affected by decisions made at the meeting.

B. Contractor shall:
1. Make physical arrangements for meetings.

C. Attendance:
1. Contractor or Contractor's Representative
2. Job Superintendent
3. Project Coordinator (Manager)
4. Owner or Owner's Representative
5. Major subcontractors
6. Major suppliers
7. Architect's Field Representative
8. Consultants as needed
9. Others as appropriate

D. Meeting Agenda, may include, but is not limited to:
1. Review and approval of minutes of previous meeting.
2. Review of Work progress since previous meeting.

3. Field observations, problems, and conflicts.
4. Review of off-site fabrication and delivery schedules.
5. Corrective measures and procedures to regain projected schedule.
6. Revisions to Construction Schedule.
7. Plan progress and schedule during succeeding work period.
8. Coordination of schedules.
9. Review submittal schedules and expedite as required.
10. Maintenance of quality standards.
11. Allowance balances.
12. Review of proposed changes and substitutions for:
    a. Effect on Construction Schedule and on completion date.
    b. Effect on other contracts of the Project.
13. Status of Allowance Expenditure Authorizations (AEAs).
14. Status of Change Proposal Requests (CPRs).
15. Status of Minor Changes (MCs).
16. Status of submittals, review of submittal log.
17. Other items and critical issues affecting Work.

3.3 PRE-INSTALLATION CONFERENCES

A. In accordance with the requirements of Section 01 11 00, Notification of Architect Requirements, the Contractor will convene pre-installation conferences when required by individual specification Sections or as required by the Architect, prior to the Contractor commencing Work of the Section.

B. Attendance, optional:
1. General Contractor or Contractor's Representative
2. Project Coordinator (Manager)
3. Owner or Owner's Representative
4. Architect's Project Manager (Project Executive)

C. Attendance, required:
1. Project Superintendent
2. Architect's Field Representative
3. Sub-contractor's Project Manager
4. Sub-contractor's Foreman
5. Engineer's Representative, as needed.
6. Manufacturer's Representative, as needed.
7. Governing Agency Official, as required
8. Inspection Agency Representative, as required.
9. Others affecting or affected by Work.

D. Meeting Agenda, may include, but is not limited to:
1. Review of conditions of installation.
2. Preparation and installation procedures.
3. Coordination with related work
4. Review of the contract document requirements.
5. Review of code enforcement or testing requirements.
6. Questions related to work required.

3.4 PRE-CLOSEOUT MEETING

A. In accordance with the requirements of Section 01 77 00, Closeout Procedures, the Contractor will convene a pre-closeout meeting when he considers the Work or designated

portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the work for its intended use.

B. Attendance, required:
1. Owner or Owner's Representative
2. Project Coordinator (Manager)
3. General Contractor or Contractor's Representative
4. Project Superintendent
5. Architect's Project Manager (Project Executive)
6. Architect's Field Representative
7. Engineer's Representative, as needed.

C. Meeting Agenda, may include, but is not limited to:
1. Review of the contract document requirements for Substantial Completion and Project Closeout
2. Review of Work which remains to be completed or corrected.
3. Closeout Document review schedule and log
4. Review of closeout procedures including, but not limited to Record Drawings, Warrantees, Operation and Maintenance Manuals, and Owner Demonstrations and Start-up.
5. Review of code enforcement or testing requirements.
6. Questions related to work required.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 GENERAL

1.1 SUBMITTALS

A. Schedules:
1. Preliminary Analysis: Within 10 (ten) days after receipt of Award of Contract, submit a preliminary construction schedule for review by Owner and Architect.
2. Construction Schedule: Within 14 (fourteen) days after receipt of Notice to Proceed, submit one (1) reproducible and four (4) prints of the approved construction schedule.

1.2 RELIANCE UPON SCHEDULE

A. The construction schedule as approved by the Architect will be an integral part of the contract and will establish conditions for various activities and phases of constructions.

1.3 CONSTRUCTION SCHEDULE

A. Diagram: Graphically show the order of all activities necessary to complete the work and the sequence in which each activity is to be accomplished.

B. Activities shown on the diagram shall include but not necessarily be limited to:
1. Project mobilization
2. Submittals and approvals of shop drawings and samples
3. Phasing of construction
4. Procurement of equipment and critical materials
5. Fabrication and installation of special material and equipment
6. Final clean-up
7. Final inspection and testing

C. The construction schedule shall be updated and submitted with each Application for Payment.

1.4 CONSTRUCTION SCHEDULE LIMITATIONS

A. Work performed under this Contract shall be done in accordance with the following paragraphs:

1. All work may proceed immediately upon Notice to Proceed and continue uninterrupted.

2. The Work shall commence on Notice to Proceed and the Work shall be Substantially Complete by **the Date negotiated in the Contract.**

3. Under the Base Proposal only, the successful Offeror will be 1) entitled to certain extensions of time and 2) subject to liquidated damages for work not completed beyond the agreed date which the Contractor shall require for Substantial Completion of the work included in this contract. Failure to achieve Substantial Completion will result in the General Contractor

being assessed Liquidated Damages in the amount of **$500.00 per calendar day** until Substantial Completion is established.

4. Failure to complete and close-out project after substantial completion may result in additional penalty / liquidated damages. Failure to achieve Close Out and Final Completion within 30 days of Substantial Completion will result in the General Contractor being assessed an additional penalty / liquidated damages in the amount of **$500.00 per calendar day** until Close Out and Final Completion is established.

5. Certificate of Substantial Completion will be issued for any of the above-mentioned areas of work which are complete prior to the completion of the entire project.

6. The Owner may at his discretion approve changes recommended by the successful Offeror to the above-mentioned schedule provided that the Owner's use of newly completed areas is not disrupted.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SUBMITTAL PROCEDURES

A. Transmit to the Architect/Engineer each item indicated in individual specification sections with approved form identifying:
   1. Date of submission and dates of any previous submissions.
   2. Project title and number
   3. Contract identification
   4. Names of Contractor, Supplier, Manufacturer
   5. Pertinent drawing sheet and detail number, and specification section number, as appropriate
   6. Deviations from Contract Documents.

B. Contractor shall be responsible for initial review prior to submittal to Architect/Engineer to verify adequacy and conformance to contract requirements. Lack of review by Contractor may be grounds for rejection.

C. Apply Contractor's stamp, signed, to each item submitted, certifying that review and verification of products, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and contract documents.

D. Transmit each item in accordance with approved schedule, and in such sequence as to cause no delay in the work or in the work of any other Contractor. Allow minimum of ten (10) days for adequate Architect/Engineer review of each submittal. Time may vary according to scope and complexity of item under review. Allow adequate time in schedule for revisions and resubmittal as deemed necessary.

E. Submit one (1) opaque print or copy of the submittal to the Architect plus one (1) electronic original. Transmit the printed copy of consultant and engineering submittals directly to respective consultants with a transmittal and the electronic original to the Architect. The Architect and Consultant will make up the printed copy and return to the Contractor upon completion of review. It will be the Contractors responsibility to scan and distribute the necessary quantity of copies of the reviewed submittal to all concerned parties.

F. Submit each item according to individual specification sections and identified by Division, Section, and individual submittal number. Maintain log according to each Division.

G. Revise and resubmit submittal as required; identify all changes made since previous submittal.
   1. Make any corrections or changes in the submittals required by the Architect/Engineer and resubmit until approved.
   2. Submit new submittal as required for initial submittal.

1.2 PROPOSED PRODUCTS LIST

A. Within 30 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.3 PRODUCT DATA

A. Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Submit the number of copies of product data and samples which the Contractor and his subcontractors need for their use PLUS two (2) additional sets for the Architect, one (1) additional set for the Owner and one (1) additional set for each of the Architect's consultants involved with the particular Section of Work.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project

1.4 MSDS SHEETS

A. The Texas Asbestos Health Protection Rules (Title 25. Health Services, Part I. Texas Department of Health Chapter 295 - Occupational Health, Subchapter C - Texas Asbestos Health Protection) were approved and became effective on October 20, 1992 and amended March 27, 2003. The Rules established the procedures and means to implement the provisions of Senate Bill 1341 and House Bill 79.

B. Pursuant to the above referenced Rules, submit MSDS Sheets showing that materials used in the Project, contain 1.0 percent or less asbestos. This requirement pertains to every material in every Section of the Specifications, as applicable to the Project, whether written therein, or not. Submit MSDS Sheets for materials, including, but not limited to the following, as applicable to the Project.

1. Surfacing Materials:
    a. acoustical plaster;
    b. decorative plaster/stucco;
    c. textured paint/coating;
    d. spray applied insulation;
    e. blown-in insulation
    f. fire proofing insulation;
    g. joint compound; and
    h. spackling compounds
2. Thermal System Insulation:
    a. taping compounds (thermal)
    b. HVAC duct insulation;
    c. boiler insulation;
    d. breaching insulation;
    e. pipe insulation; and
    f. thermal paper products
3. Miscellaneous Material:
    a. cement wallboard/siding;
    b. asphalt/vinyl floor tile
    c. vinyl sheet flooring/vinyl wall coverings;

d. floor backing;
e. construction mastic;
f. ceiling tiles/lay-in ceiling panels;
g. packing materials;
h. high temperature gaskets;
i. laboratory hoods/table tops
j. fire blankets/curtains;
k. elevator equipment panels;
l. elevator brake shoes;
m. ductwork flexible fabric connections;
n. cooling towers;
o. heating and electrical ducts;
p. electrical panel partitions;
q. electrical cloth/electrical wiring insulation;
r. chalkboards;
s. roofing shingles/tiles;
t. roofing felt;
u. base flashing;
v. fire doors;
w. caulking/putties;
x. adhesives/mastics; and
y. wallboard

1.5 SHOP DRAWINGS

A. Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. All dimensions indicated on the drawings are based on the specific models and manufacturers of products, equipment, fixtures and miscellaneous items specified. If the Contractor uses an approved product by another listed manufacturer which is different than the specific model and manufacturer listed in these specifications, then the Contractor shall be solely responsible for the coordination of any dimensional changes required, including structural, relocation of walls, equipment, fixtures, ceilings and miscellaneous items. When dimensional changes are required in these situations, the Contractor shall submit a proposed modification drawing to the Architect for approval prior to proceeding with the work. All causes and effects of the dimensional change shall be indicated on the Contractor’s drawing submittal.

1.6 SAMPLES

A. Submit for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Submit for aesthetic, color, or finish selection. Submit full range of manufacture's standard colors, textures, and patterns for Architect's selection.

C. Submit samples to illustrate functional characteristics of the Product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

D. Submit the number specified in respective Specification Section; minimum of two (2), of which one (1) will be retained by Architect.

E. Reviewed samples which may be used in the Work are indicated in individual specification sections.

F. Samples will not be used for testing purposes unless specifically stated in specification section.

1.7 DESIGN DATA

A. When required, submit for Architect/Engineer's knowledge as contract administrator or for Owner.

B. Submit design data for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.8 TEST REPORTS

A. In accordance with Section 01 45 23, Inspection and Testing Laboratory Services, submit test reports for Architect/Engineer's knowledge as contract administrator or for Owner. Architect will determine whether corrective action is required.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect, in quantities specified.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Architect and Owner.

D. Submit required certificates in duplicate.

1.10 GUARANTEES

A. When specified in individual specification sections, submit warranties by manufacturer, installation/application subcontractor, fabricator, or Contractor to Architect, in quantities specified.

B. Submit warranties in accordance with Section 01 77 00, Closeout Procedures.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect for delivery to Owner in quantities specified.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. Submit required instructions in duplicate.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports for Architect/Engineer's benefit as contract administrator or for Owner.

B. Submit report in quantity specified or required within ten (10) days of observation to Architect for information. Architect will determine whether corrective action is required.

C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 ERECTION DRAWINGS

A. When required, submit drawings for Architect/Engineer's benefit or for Owner.

B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner. Architect will determine whether corrective action is required.

1.14 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs monthly of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect/Engineer.

B. Photographs: digital; sent to Architect via email or provide on non-rewritable compact disk. Along with Application for Payment, include one (1) reproducible copy of contact sheet of all photographs taken during that period indicating Work completed and identified as stated below.

C. Photograph project conditions five (5) days maximum prior to submitting indicating relative progress of the Work. Do not photograph conditions previously photographed if no work has proceeded. As able, take photographs from same position indicating same view in successive installments.

D. Take photographs as evidence of existing project conditions as follows:
1. Site: Take four (4) site photographs at project corners
2. Interior views: Take two (2) minimum interior photographs of each space under construction from differing directions or as required.
3. Exterior views: Take two (2) photographs of each elevation.
4. Details: Take as required to document concealed conditions, including, but not limited to, underground construction, utility penetrations and installation, steel erection, concrete and masonry reinforcing, waterproofing and flashing, and roofing installation.
5. Cavity wall: Provide photographic evidence that cavity wall was maintained clean and free of debris and excess mortar.

E. Identify each photograph with name of Project, room or view, and date.

PART 2 – PRODUCTS Not Used

PART 3 – EXECUTION Not Used

END OF SECTION

SECTION 013300 - SUBMITTALS

1.00 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Submit documentation as required by the Contract Documents and as reasonably requested by the Owner and Engineer to:
   1. Record the products incorporated into the Project for the Owner.
   2. Provide information for operation and maintenance of the Project.
   3. Provide information for the administration of the Contract.
   4. Allow the Engineer to advise the Owner if products proposed for the project by the Contractor conform, in general, with the design concepts of the Contract Documents.

B. Contractor's responsibility for full compliance with the Contract Documents is not relieved by the Engineer's review of submittals. Contract modifications may only be approved by Change Order or Field Order.

1.2 CONTRACTOR'S RESPONSIBILITIES

A. Review all submittals prior to submission.

B. Determine and verify:
   1. Field measurements.
   2. Field construction requirements.
   3. Location of all existing structures, utilities and equipment related to the submittals.
   4. Submittals are complete for their intended purpose.
   5. Conflicts between the submittals related to the various subcontractors and suppliers have been resolved.
   6. Quantities and dimensions shown on the submittals.

C. Submit information per the procedures described in this section and the detailed specifications.

D. Furnish the following submittals:
   1. As specified in the attached Submittal Schedule.
   2. Schedules, data and other documentation as described in detail in this section or referenced in the General Conditions.
   3. Submittals as required in the detailed specifications.
   4. Submittals not required will be returned without Engineer's review.

E. Submit a schedule indicating the date submittals will be sent to the Engineer and proposed dates that the product will be incorporated into the project. Make submittals promptly in accordance with the schedule so as to cause no delay in the project.
   1. Submittals shall be sent to Engineer allowing a reasonable time for delivery, review and marking submittals. Time for review is to include time for resubmission if necessary and to allow adequate time for the ordering, fabrication, and delivery of the product.

2. Schedule submittal to provide all information for interrelated work at one time. No review will be performed on submittals requiring coordination with other submittals. Engineer will return submittals for resubmission as a complete package.

F. Installation of any products prior to the approval of shop drawings is done at the Contractor's risk. Products not meeting the requirements of Contract Documents are defective and may be rejected at the Owner's option.

G. Payment will not be made for products for which submittals are required until the submittals have been received. Payment will not be made for products for which shop drawings or samples are required until these are approved by the Engineer.

1.3 QUALITY ASSURANCE

A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Submittals not meeting these criteria will be returned without review.

B. Demonstrate that the proposed products are in full and complete compliance with the design criteria and requirements of the Contract Documents including drawings and specifications as modified by Addenda, Field Orders, and Change Orders.

C. Furnish and install products that fully comply with the information included in the submittal.

D. Review and approve submittals prior to submitting them to the Engineer for review. Submittals will not be accepted from subcontractors, suppliers, or anyone other than the Contractor.

1.4 SUBMITTAL PROCEDURES

A. Deliver submittals to the Engineer.

B. Assign a number to the documents originated to allow tracking of the submittal during the review process.
1. Assign a number consisting of a prefix, a sequence number, and a letter suffix. Prefixes shall be as follows:

Prefix	Description	Originator
CO	Change Order	Contractor
CMR	Contractor’s Modification Request	Contractor
CTR	Certified Test Report	Contractor
EIR	Equipment Installation Report	Contractor
FO	Field Order	Engineer
NBC	Notification by Contractor	Contractor

O&M	Operation & Maintenance Manuals	Contractor
PCM	Proposed Contract Modification	Engineer
PR	Payment Request	Contractor
PP	Project Photographs	Contractor
RD	Record Data	Contractor
RFI	Request for Information	Contractor
SAM	Sample	Contractor
SD	Shop Drawing	Contractor
SCH	Schedule of Progress	Contractor

2. Issue sequence numbers in chronological order for each type of submittal.
3. Issue numbers for re-submittals that have the same number as the original submittal followed by an alphabetical suffix indicating the number of times the same submittal has been sent to the Engineer for processing. For example: SD-025-A represents a shop drawing that is the twenty-fifth submittal of this type and is the second time this submittal has been sent for review.
4. Clearly note the submittal number on each page or sheet of the submittal.
5. Correct assignment of numbers is essential since different submittal types are processed in different ways.

D. Submit documents with uniform markings and page sizes.
   1. Paper size shall allow for ease of reproduction.
      a. Submit documents on 8-1/2" X 11" paper where practical.
      b. Use 11" X 17" paper for larger drawings and schematics.
      c. Use full size blueline sheets for fabrications and layout drawings. Reproducible drawings may be submitted in lieu of bluelines.
   2. Mark submittals to:
      a. Indicate Contractor's corrections in green.
      b. Highlight items pertinent to the products being furnished in yellow and delete items that are not when the Manufacturer's standard drawings or information sheets are provided.
      c. Cloud items and highlight in yellow where selections by the Engineer or Owner are required.
      d. Mark dimensions with the prefix FD to indicate field verified dimensions on the drawings.
      e. Provide a blank space 8" x 3" for Contractor's and Engineer's stamp.

E. Mark submittals to reference the drawing number and/or section of the specifications, detail designation, schedule or location that corresponds with the data submitted. Other identification may also be required, such as layout drawings or schedules to allow the reviewer to determine where a particular product is to be used.

F. The number of copies of each submittal to be sent by the Contractor and the number of copies of each submittal to be returned are:

Prefix	Description	No. of Copies Sent	No. of Copies Returned
CO	Change Order	2	1
CTR	Certified Test Report	2	0
EIR	Equipment Installation Report	2	0
NBC	Notification by Contractor	2	1
O&M	Preliminary O&M Manuals	2	1
O&M	Final O&M Manuals	4	0
PR	Payment Request	2	1
PP	Project Photographs (including videotapes)	2	0
RD	Record Data	2	0
RFI	Request for Information	2	1
SAM	Sample	2	0
SD	Shop Drawings	5	2
SCH	Schedule of Progress	2	0

1.5 REVIEW PROCEDURES

A. Priority submittals will be reviewed before other submittals for this project, which have been received but not reviewed.

1.6 REQUIREMENTS

A. Certifications, Warranties and Service Agreements include documents as specified in the detailed specifications, as shown in the submittal schedule or as follows:
   1. Certified Test Reports (CTR) - A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the specifications. (Refer to Section 01400, QUALITY CONTROL.)
   2. Certification of Local Field Service (CLS) - A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300 mile radius of the project site. List names, addresses, and telephone numbers of approved service organizations on or attach to the certificate.
   3. Extended Warranty (EW) - A guarantee of performance for the product or system beyond the normal one (1) year warranty described in the General Conditions. Issue the warranty certificate in the name of the Project Owner.
   4. Extended Service Agreement (ESA) - A contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance

for a definite period of time beyond the warranty period. Issue the service agreement in the name of the Project Owner.

5. Certification of Adequacy of Design (CAD) - A certified letter from the manufacturer of the equipment stating that they have designed the equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
6. Certification of Applicator/Subcontractor (CSQ) - A certified letter stating that the Applicator or Subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.

B. Submit record data to provide information to allow the Owner to adequately identify the products incorporated into the project and allow replacement or repair at some future date.
   1. Provide record data for all products. Record data is not required for items for which shop drawings and/or operations and maintenance manuals are required.
   2. Provide information only on the specified products. Submit a Contractor's Modification Request for approval of deviations or substitutions and obtain approval by Field Order or Change Order prior to submitting Record Data.
   3. Record data will be received by the Engineer, logged, and provided to Owner for his/her record.
      a. Record data may be reviewed to see that the information provided is adequate for the purpose intended. Inadequate drawings may be returned as unacceptable.
      b. Record data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are noted during the cursory review performed to see that the information is adequate.

1.7 REQUESTS FOR DEVIATION

A. Submit requests for deviation from the Contract Documents for any product that does not fully comply with the specifications.

B. Submit request by Contractor's Modification Request (CMR). Identify the deviations and the reason the change is requested.

C. Deviations that result in a reduction in cost shall also include the amount of the reduction to the Owner.

D. A Change Order or Field Order will be issued by the Engineer for deviations approved by the Owner. Deviations from the Contract Documents may only be approved by Change Order or Field Order.

1.8 SUBMITTALS FOR SUBSTITUTIONS

A. Substitutions are defined as any product that the Contractor proposes to provide for the Project in lieu of the specified product.

B. If the Contractor desires to submit a manufacturer or product which is not specified, the Contractor must submit the following for consideration of approval of the substitution:
   1. Contractor's Modification Request for deviation from the Contract Documents per Paragraph 1.07.
   2. Prove that the product is acceptable as a substitute. It is not the Engineer's responsibility to prove the product is not acceptable as a substitute.
      a. Indicate on a point by point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
      b. Make a direct comparison with the specified manufacturer's published data sheets and available information. Provide this printed material with the submittal.
      c. The decision of the Engineer regarding the acceptability of the proposed substituted product is final.
   3. Provide a typewritten certification that, in making the substitution request, the Contractor:
      a. Has determined that the substituted product will perform in substantially the same manner and result in the same ability to meet the specified performance as the specified product.
      b. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the Manufacturer of the specified product.
      c. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into the project and will waive all claims for additional work, which may be necessary to incorporate the substituted product into the project, which may subsequently become apparent.
      d. Will maintain the same time schedule as for the specified product.

C. Engineering cost for review of substitutions will be paid by the Contractor.
   1. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of shop drawings by Engineer and in accordance with the following rates:

Principal-in-Charge	**$ 250.00**
Project Manager	**$ 175.00**
Design Engineer	**$ 125.00**
Engineering Technician	**$ 95.00**
Clerk	**$ 65.00**

   2. Cost for the additional review shall be paid to the Owner by the Contractor on a monthly basis.

1.9 GUARANTEES

A. Warranties and guarantees shall be submitted as required by the Contract Documents and submitted with the shop drawings or record data.

1.10 RESUBMISSION REQUIREMENTS

A. Make all corrections or changes in the submittals required by the Engineer and resubmit until approved.

B. Need for more than one resubmission or any other delay of obtaining Engineer's review of submittals, will not entitle the Contractor to an extension of Contract Time. All costs associated with such delays shall be at the Contractor's expense.

1.11 ENGINEER'S DUTIES

A. Review the submittals and return with reasonable promptness.

B. Affix stamp, indicate approval, rejection, and the need for re-submittal.

C. Distribute documents.

SUBMITTAL SCHEDULE

Spec. No.	Description	SD	SAM	CTR	CLS	EW	ESA	CAD	CSQ	RD	OM	EIR	PPB
02520	Concrete Pavement	X											
02556	Water Transmission Lines and/or Pressure Sewer Lines	X											
02558	Water Valves	X											
02570	Sanitary Sewers	X											
02601	Flexible Base	X											
02612	Hot Mix Asphalt Concrete Pavement	X											
03300	Cast-in-Place Concrete	X											

SD - Shop Drawing
SAM - Sample
CTR - Certified Test Report
CLS - Certification of Local Field Service
EW - Extended Warranty
ESA - Extended Service Agreement
PPB - Process Performance Bond
CAD - Certificate of Adequacy of Design
CSQ - Certification of Applicator/ Subcontractor Qualifications
RD - Record Data
OM - Operation and Maintenance Manuals
EIR - Equipment Installation Report

END OF SECTION 013300

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SECTION 01 35 16

ALTERATION PROJECT PROCEDURES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. This Section contains general provisions and requirements pertaining to all remodeling, removal and relocation of Work in the existing building and becomes a part of each Section and Division performing remodeling, removal and relocation Work for this Project with the same force and effect as if written in full therein.

B. Take all necessary precautions to keep trespassers out of the Work areas. Secure Work areas from entry when Work is not in progress.

C. Perform all alterations, remodeling, demolition, removal and relocation of Work in strict accordance with Owner's instructions and applicable Federal, State and local health and safety standards, codes and ordinances. Where conflicts occur, the more restrictive requirement shall govern.

1.2 RELATED WORK

A. Section 02 41 16 - Selective Demolition

1.3 EXISTING CONDITIONS

A. Obvious existing conditions, installations and obstructions affecting the Work shall be taken into consideration as necessary Work to be done, the same as though they were completely shown or described.

B. Items of existing construction indicated to remain upon completion of the Contract, but which require removal to complete the Work, shall be carefully removed and replaced as required. The replaced Work shall match its condition at the start of the Work unless otherwise required.

C. Visit the site to determine by inspection all existing conditions, including access to the site, the nature of structures, objects and materials to be encountered, and all other facts concerning or affecting the Work. Information on the Drawings showing existing conditions does not constitute a guarantee that other items may not be found or encountered.

D. Utilities: Do not interrupt existing utilities serving occupied or used facilities, except when authorized by the Architect in writing two (2) weeks in advance. Provide temporary services during interruptions to existing utilities.

PART 2 - PRODUCTS

2.1 SALVAGED MATERIALS

A. The Owner reserves the right of first refusal on all salvage items. Remove remaining items from the site as Work progresses. Storage or sale of items on site is not permitted. Burning or burying of removed materials on site is not permitted.

B. Store salvaged items in a dry, secure place on site.

C. Salvaged items not required for use in repair of existing Work shall remain the property of the Owner.

D. Do not incorporate salvaged or used material in new construction except with permission of the Architect.

2.2 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

A. Contract Documents do not define products or standards of workmanship present in existing construction. Determine products by inspection and by use of the existing. Provide same or similar quality products or types of construction as that in existing structure when needed to patch or extend existing Work.

B. If reasonably matching products are not obtainable, improve appearance by minor relocating of some existing products and grouping new ones in some pattern arranged by the Architect. Do not replace products scheduled for retaining because matching ones are not obtainable, except as directed by Change Order.

PART 3 - EXECUTION

3.1 PROTECTION OF WORK TO REMAIN

A. Protect existing Work from damage. Use barricades, tarpaulins, temporary walls, plywood, planking, masking, or other suitable means and methods as approved by the Architect.

B. If Work to remain in place is damaged, restore to original condition at no additional cost to the Owner.

C. Concealed Conditions: If conditions cause changes in the Work from requirements of the Contract Documents, the Contract Sum will be adjusted in accordance with the General Conditions.

3.2 PROCEDURES

A. Refinishing at Removed Work: Cut below surface of substrate materials and patch over area of removal with finish materials so removal is not apparent.

B. Remove and replace existing ceilings, and cut, patch, or replace existing walls, partitions and floors as may be necessary for access to valves, piping, conduit and tubing by mechanical and electrical trades as directed and approved by the Architect, and performed by the appropriate subcontractor for the Work involved, or by other properly qualified subcontractors.

C. Patch and extend existing Work using skilled mechanics who are capable of matching existing quality and workmanship. Quality of patched or extended Work shall be not less than that specified for new Work.

D. Cutting:
1. Concrete and Masonry: Saw cut where feasible.
2. Plaster: Cut back to sound plaster on straight lines, and back-bevel edges of remaining plaster. Trim and prepare existing lath for tying of new lath.
3. Woodwork: Cut back to a joint or panel line. Undamaged removed materials may be reused.

4. Resilient Tiles: Remove in whole units to natural breaking points or straight joint lines with no damaged or defective existing tiles remaining where joining new construction.
5. Salvaged Materials: Carefully remove to avoid damage, thoroughly clean and reinstall as indicated, or as directed.
6. Doors: Remove in such a manner as to facilitate filling in of openings or installation of new Work, as required by Drawings.
7. Structural Elements: Remove only as shown on the Structural Drawings. If not specifically shown, but removal is required, perform such removal or alteration only upon written approval of the Architect. Do not damage or alter any structural element of the existing building.

E. Patching:
1. Match existing Work where possible; if unavailable, use salvage material for patching and provide totally new material in areas where salvage has been removed; consult with the Architect concerning locations for salvaging materials.
2. Repairs or continuations of existing Work shall be relatively imperceptible in the finished Work when viewed under finished lighting conditions from a distance of six (6) feet.
3. Patching, Repairing and Finishing of Existing Work: Perform in compliance with the applicable requirements of the Specification Section covering the Work to be performed and the requirement of this Section.

F. Erect scaffolding as necessary to gain access to the various parts of the Work. Provide structurally sound, rigidly braced and properly constructed scaffolding, shoring and bracing as necessary to positively protect the affected elements and building, and to support the activities or workmen and loads. Design and construction of scaffolds and supports shall be in accordance with applicable safety regulations. Material used shall be adequate to support anticipated loads with a properly calculated margin of safety.

G. Noise Producing Equipment: Minimize use of noise producing equipment. Limit excessive noise to periods of vacancy or provide sound control. Arrange schedules in advance with the Architect.

3.3 EXISTING FURNITURE AND EQUIPMENT

A. Owner Salvaged Items: Personal items in areas subject to remodeling will be removed before construction in those areas commences.

B. Furniture Items: Before remodeling commences, Owner will remove all furniture and equipment from each space, store items as necessary. Owner will replace these items to the same locations after each remodeling phase is complete. Contractor to coordinate activities with Owner.

3.4 PAINTING

A. Preparation: Prepare patched areas as required for new Work. Wash existing painted surfaces with neutral soap or detergent, thoroughly rinse, and sand when dry.

B. Painting and Finishing: Conform to the applicable provisions of the Painting Section. Prepare bare areas and patches in existing painted surfaces with specified primer and intermediate coats, sanded smooth and flush with adjoining surfaces.

3.5 DISPOSAL OF DEBRIS

A. Remove material, debris and rubbish resulting from Work of this Section from the building and site as it accumulates. Keep all areas of Work in “broom clean” condition as the Work progresses.

B. At completion of renovation and remodeling Work in each area, provide final cleaning and return space to a condition suitable for use by the Owner.

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality Assurance.

B. References Standards.

C. Definitions.

D. Abbreviations.

E. Format and Specification Context Explanations.

F. Drawing Symbols.

G. General Requirements.

1.2 QUALITY ASSURANCE

A. General:
1. For products or workmanship specified by a standard of an association, trade, or Federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable code authorities having jurisdiction.
2. The contractual relationship of the parties to the Contract should not be altered from the Contract Documents by mention or inference otherwise in any reference standard.
3. Obtain copies of standards when required by Contract Documents.
4. Maintain copy of standards at jobsite during submittals, planning, and progress of the specific work for which the standards pertain, until the date of Substantial Completion.
5. In the absence of specific instructions in the specifications, materials, products, equipment and their installation shall conform to the applicable codes, regulations and standards specified therein. When a conflict exists between the applicable code, regulation and standard and that specified, the more stringent code regulation or standard shall prevail, except as authorized by applicable authorities having jurisdiction.

B. Specifications and Drawings: The Drawings and Specifications are correlative and have equal authority and priority. Base disagreements in themselves or in each other on the most expensive combination of quantity and quality of work indicated. In the event of such disagreement bring it to the attention of the Architect, who will determine the appropriate method to perform the work.

C. Industry Standards: Where compliance with two (2) or more industry standards or sets of requirements are specified and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent

requirement is intended and will be enforced, unless specifically detailed language written into Contract Documents clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to the Architect for a decision before proceeding.

D. Contractor's Option: Except for overlapping or conflicting requirements, where more than one (1) set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether or not it is specifically indicated as such.

E. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with the minimum (within specified tolerances) or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to Architect for decision before proceeding.

F. Specialists' Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists, who are engaged for performance of work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with applicable regulations, union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of requirements remains with the Contractor.

1.3 REFERENCE STANDARDS

A. Dates of codes, regulations and standards specified shall be the latest date of issue of that code, regulation or standard prior to the date of issue of this Project Manual or Document, except as modified or otherwise directed by the applicable codes and their supplements and amendments adopted by the code authorities having jurisdiction.
   1. Date of Issue - The "date of issue" as it appears in the statement above, means the date which appears on the cover of the Project Manual or Document corresponding to the date of issue of the Contract Documents.
   2. Code Authorities: The "code authorities" as it appears in the statement above, means the authorities responsible for code enforcement.

1.4 DEFINITIONS

A. General Explanation: A substantial amount of specification language consists of definitions for terms found in other Contract Documents, including those in the AIA A201 General Conditions of the Contract for Construction, Supplementary Conditions, the Drawings, and the Specifications. Drawings must be recognized as being diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in the Contract Documents are defined in the General Conditions, Supplementary Conditions, and in this Section. Definitions and explanations contained in this Section are not necessarily either complete or exclusive but are general for this Work to the extent that they are not stated more explicitly in another element of the Contract Documents. In the event of a conflict in definitions or explanations within the Contract Documents or whenever there is need of clarification or interpretation of definitions within or between the Contract Documents, notify the Architect immediately and proceed as

directed. Except in cases where definitions are determined by code authorities having jurisdiction, the Architect's interpretation of all definitions will take precedence.

B. General Requirements: The provisions or requirements of Division 1 - Sections apply to entire Work of Contract and, where indicated, to other elements which are included in the Project.

C. Special Conditions: Wherever the term "Special Conditions", appears in the Contract Documents, it refers collectively to all requirements of the Owner in addition to the sections in Division 1, General Requirements, and to Articles contained in the General Conditions and Supplementary Conditions.

D. Architect: Wherever the term "Architect" or any derivative thereof appears in the Contract Documents, it means Alvarado Architects & Associates, Inc, 307 South Main Street, Donna, Texas 78537, (956) 464-8258, or their authorized representative(s).

E. Bid, Competitive Sealed Proposal (CSP), Response, Offer, etc.: Wherever the term "Bid", "Competitive Sealed Proposal (CSP)", "Response", "Offer", "Proposal", or any derivative thereof, or similar term appears in the Contract Documents, they mean one and the same, and shall mean Competitive Sealed Proposal, which by definition allows the Owner to accept the "best value" for the Owner based on factors other than cost in selecting the Contractor.

F. Contractor, General Contractor, Construction Manager, etc: Wherever the term "Contractor", "General Contractor", "Construction Manager" or any derivative thereof, or similar term appear in the Contract Documents, they mean one and the same.

G. Subcontractor, Sub-subcontractor, Bidder, etc.: Wherever the term "Subcontractor", Sub-subcontractor", "Bidder", "Bidder/Vendor", "Vendor", "Installer", "Integrator", "Respondent", "Offeror", or any derivative thereof, or similar term appears in the Contract Documents, they mean one and the same, and shall refer to the entity (person or firm) licensed and meeting all applicable regulations of the State of Texas and Department of Labor to perform the Work, or their authorized representative(s).
   1. Responsibilities: To avoid any misunderstanding or lack of interpretation, the responsibility for performing the Work is totally that of the entity defined above, and the resolutions proposed in his shop drawings and related documentation shall be demonstrated throughout the Work and specified warranty period.
   2. In the event of a controversy involving the Contract Documents or interpretation of Project requirements, the decision of the Architect will take precedence.

H. County, Hidalgo County, Precinct, Owner, etc.: Wherever the term "County", "Hidalgo County", "Owner", "Precinct", or similar such term appears in the Contract Documents, it means Hidalgo County Precinct 1, 1902 Joe Stephens Avenue, Suite. 101, Weslaco, Texas 78596; Ph: (956) 968-8733, or its authorized representative(s).

I. Consultants: Wherever the term "Consultant", or any derivative thereof appears in the Contract Documents, it means the following to whom that portion of the work applies.
   1. Owner's Consultants:
      a. Project Manager: B2Z Engineering, 900 South Stewart Road, Suite 4, Mission, Texas 78572; (956) 585-3773, or their authorized representative(s).
      b. Geotechnical Consultant: Millennium Engineers Group (MEG) Inc., 5804 North Gumwood Avenue, Pharr, Texas 78577; (956) 702-8500, or their authorized representative(s).

c. Surveyors: Halff Associates, 5000 W. Military Hwy, Suite100, McAllen, Texas 78503; Ph: (956) 664-1960, or their authorized representative(s).
d. Civil Engineers: Halff Associates, 5000 W. Military Hwy, Suite100, McAllen, Texas 78503; Ph: (956) 664-1960, or their authorized representative(s).
e. Structural Engineering: Chanin Engineering, LLC, 400 W. Nolana Avenue, McAllen, Texas 78504; Ph: (956) 687-9421, or their authorized representative(s).
f. MEP / T Engineers: Halff Associates, 5000 W. Military Hwy, Suite100, McAllen, Texas 78503; Ph: (956) 664-1960, or their authorized representative(s).

2. Architect's Consultants:
   a. none

J. Indicated: Wherever the term "indicated", or any derivative thereof appears in the Contract Documents, it means a cross-reference to graphic representations, notes, or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in the Contract Documents. Where terms such as “shown”, “noted”, “scheduled”, and “specified” are used in lieu of “indicated”, it is for the purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

K. Directed, Requested, Etc: Where not otherwise explained, terms such as “directed”, “requested”, “authorized”, “selected”, “approved”, “required”, “accepted”, and “permitted” or any derivative thereof appears in the Contract Documents, it means as “directed by the Architect”, “requested by the Architect”, and similar phrases with actions taken by the Architect. However, no meaning or otherwise shall be interpreted to extend the Architect’s responsibility into Contractor’s area of construction supervision.

L. Approve: Wherever the term “Approve”, or any derivative thereof appears in the Contract Documents, it means only the Architect, or an individual designated by him as his representative, can approve or disapprove contract actions. Even if the specifications indicate that an individual other than the Architect, such as the “Engineer” or “Consultant” will approve or disapprove an action, it is understood that only the Architect has this authority unless the individual is so designated by him in writing. Even when an individual is so designated, the Contractor may appeal the action to the Architect and the Architect’s decision will be final. In no case, will “approval” by the Architect be interpreted as a release of the Contractor from responsibility to fulfill requirements of the Contract Documents.

M. Furnish: Wherever the term “Furnish”, or any derivative thereof appears in the Contract Documents, it means supply or deliver to Project site, ready for unloading, unpacking, assembly, erection, placing, installing, anchoring, applying, curing, finishing, protecting, cleaning and similar operations, as applicable in each instance.

N. Install: Wherever the term “Install”, or any derivative thereof appears in the Contract Documents, it means performing the operations at the Project site, of unloading, unpacking, assembly, erection, placing, installing, anchoring, applying, curing, finishing, protecting, cleaning and similar operations, as applicable in each instance.

O. Provide: Wherever the term “Provide”, or any derivative thereof appears in the Contract Documents, it means furnish and install at the Project site, complete and ready for intended use, as applicable in each instance.

P. Project, Site: Wherever the term “Project”, “Site”, or similar such term appears in the Contract Documents, it means the space available to the Contractor for performance of the Work, either exclusively or in conjunction with others performing work as part of the Project. The extent of project or site is shown on the Drawings and may or may not be identical with description of land upon which Project is to be built.

Q. Installer: Wherever the term “Installer”, or any derivative thereof appears in the Contract Documents, it means the entity (person or firm) engaged by the Contractor or its subcontractor or sub-subcontractor for performance of a particular unit of work at the Project, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

R. Specialist: Wherever the term “Specialist”, or any derivative thereof appears in the Contract Documents, it means an individual or firm of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workmen skilled in either (as applicable) manufacturing or fabricating items required by the Contract, installing items required by the Contract, or otherwise performing work required by the Contract. Where the Contract Specification requires installation by a specialist, that term shall also be deemed to mean either the manufacturer of the item or firm who will perform the work under the manufacturer’s direct supervision.

S. Testing Laboratory: Wherever the term “Testing Laboratory”, or any derivative thereof appears in the Contract Documents, it means an independent entity engaged to perform specific inspections or tests of the work, either at the Project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

1.5 FORMAT AND SPECIFICATION CONTEXT EXPLANATIONS

A. Underscoring: Is used strictly to assist reader of specification text in scanning text for key words (for quick recall). No emphasis on or relative importance is intended where underscoring is used.

B. Capitalization: Except for manufacturer, product, or trademark names, capitalization is used strictly to assist reader of specification text in scanning text for key words (for quick recall). No emphasis on or relative importance is intended where capitalization is used.

C. Imperative language: Is used generally in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by the Contractor, or when so noted, by others.

D. Section Numbering: Is used to facilitate cross-reference in Contract Documents. Sections are placed in Project Manual in numeric sequence; however, numbering sequence is not complete, and listing of sections at beginning of Project Manual must be consulted to determine numbers and names of specification sections in Contract Documents.

E. Page Numbering: Pages are numbered independently for each section. The section number is shown preceded by the project number and followed by the page number at the bottom of each page, to facilitate the location of text. The project number is given to

identify the project, for which specification was written, should the section become separated from the Project Manual.

F. Specifying Methods: The techniques or methods of specifying to record requirements varies throughout text, and may include “prescriptive, “open-generic descriptive”, “compliance with standards”, “performance”, or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.

G. Abbreviations: The language of Specifications and other Contract Documents is of the abbreviated type in certain instances and implies words and meanings which will be appropriately interpreted. Actual work abbreviations of a self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in section at first instance of use. Trade association names and titles of general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the Contract Documents so indicates. A list of typical abbreviations includes but is not limited to the following trade associations and organizations. Refer to Drawings and other Contract Documents for other abbreviations.

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Assn.
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACIL	American Council of Independent Laboratories
AGA	American Gas Association
AGC	Associated General Contractors of America
AHA	American Hardboard Association
AHGA	American Hot dip Galvanizers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron & Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	Air Conditioning & Refrigeration Institute
ASA	Acoustical Society of America
ASA	American Subcontractors Association
ASAHC	American Society of Architectural Hardware Consultants
ASC	Adhesive & Sealant Council, Inc.
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Professional Engineers
ASPI	American Wood Preserver's Institute
ASTM	ASTM International
AWI	Architectural Woodwork Institute
AWS	American Welding Society
BIA	Brick Institute of America
BRI	Building Research Institute
CRA	California Redwood Association
CLFMI	Chain Link Fence Manufacturers Institute
CRSI	Concrete Reinforcing Steel Institute

CSI	Construction Specifications Institute
DHI	Door and Hardware Institute
EPA	Environmental Protection Agency
FTI	Facing Tile Institute
FGMA	Flat Glass Marketing Association
GA	Gypsum Association
HPMA	Hardwood Plywood Manufacturers Association
IBC	International Building Code
ICBO	International Conference of Building Officials
ICC	International Code Council
IEEE	Institute of Electrical and Electronic Engineers
JSMA	Joint Sealer Manufacturers Association
MFMA	Maple Flooring Manufacturers Association
ML/SFA	Metal Lath/Steel Framing Association
NAAMM	National Association of Architectural Metal Manufacturers
NAMM	National Association of Mirror Manufacturers
NBLP	National Bureau of Lathing & Plastering
NCPI	National Clay Pipe Institute
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Assn.
NESC	National Environmental Systems Contractors
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NHLA	National Hardwood Lumber Association
NOMMA	National Ornamental Metal Manufacturers Assn
NPVLA	National Paint, Varnish and Lacquer Assn.
NRMCA	National Ready Mixed Concrete Assn.
NRCA	National Roofing Contractors Association
NSPE	National Society of Professional Engineers
NWMA	National Woodwork Manufacturers Assn., Inc.
OSHA	Occupational Safety and Health Administration
PDCA	Painting and Decorating Contractors of America
PI	Perlite Institute, Inc.
PCA	Portland Cement Association
RFCI	Resilient Floor Covering Institute
RVFC	Rubber and Vinyl Floor Council
SBCCI	Southern Building Code Congress International, Inc.
SFPA	Southern Forest Products Association
SHLMA	Southern Hardwood Lumber Manufacturing Assn.
SDI	Steel Deck Institute
SDI	Steel Door Institute
SJI	Steel Joist Institute
SSPC	Steel Structures Painting Council
TCA	Tile Council of America, Inc.
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc.
VBI	Venetian Blind Institute
VFI	Vinyl Fabrics Institute
WCLIB	West Coast Lumber Inspection Bureau
WRCLA	Western Red Cedar Lumber Association
WWPA	Western Wood Products Association

1.6 DRAWING SYMBOLS

A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols defined by "Architectural Graphic Standards", published by the American Institute of Architects (AIA) and John Wiley & Sons, Inc., latest edition. Refer instances of uncertainty to Architect for clarification before proceeding.

B. Mechanical/Electrical Drawings: Graphic symbols used in Mechanical/Electrical Drawings are generally aligned with symbols recommended by American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). Where appropriate, those symbols are supplemented by more specific symbols as recommended by other recognized technical organizations, including, but not limited to American Society of Mechanical Engineers (ASME), American Society of Professional Engineers (ASPE), Institute of Electrical and Electronic Engineers (IEEE) and similar organizations. Refer instances of uncertainty to Architect for clarification before proceeding.

1.7 GENERAL REQUIREMENTS

A. Color, Texture, or Pattern Requirements:
1. When color, texture, or pattern is specified, the item, product, or material shall be furnished in the specified color, texture, or pattern, as applicable.
2. When more than one (1) approved manufacturer is named in the Specifications, Contractor may select any of the approved manufacturers and submit the full range of colors, textures, and patterns (standard and special) available of that manufacturer for the Architect's review and selection.
3. When the term "match existing", or any derivative thereof appears in the Contract Documents, it means that the sample must match the Owner's existing work in every respect as to color, texture, and pattern, as applicable.
4. When the term "match Architect's approved sample", or any derivative thereof appears in the Contract Documents, it means that the Architect has selected a sample which must be matched in every respect as to color, texture, and pattern, as applicable.
5. When an item or product is specified of a manufacturer for which only one (1) color, texture, or pattern is available, and a color, texture, or pattern other than that one is specified, Contractor shall bring it to the attention of the Architect for a decision prior to proceeding with the work. Do not proceed with the work until Architect has approved the color, texture, and pattern, as applicable.
6. When an item or product is specified of a manufacturer for which no color, texture, or pattern is specified, and colors, textures, and patterns are available, Contractor shall bring it to the attention of the Architect and submit the full range of colors, textures, and patterns (standard and special) available of that manufacturer for the Architect's review and selection. Do not proceed with the work until Architect has selected and approved the color, texture, and pattern, as applicable.
7. When due to the nature of the item, product, or material, i.e. face brick, tile pavers, natural stone, etc, Contractor shall submit sample or samples which exhibits the full range of characteristics (colors, i.e. lights and darks, as well as textures, and patterns) for which the item, product, or material is available. The Architect will select the color, texture, and pattern, as applicable, from those available and request a sample panel exhibiting the approved characteristics. The approved color range, texture, and pattern, as applicable will then become the standard for which all work on the project will be judged. Architect will be final judge as to having performed work in conformance with approved characteristics.

8. Under no circumstances are colors, textures, patterns, or any other characteristics for which an item, product, or material are available to be selected by anyone other than the Architect or his authorized representative.
9. Non-conforming work shall be removed from the site and replaced with new conforming work at no additional expense to Owner.

B. Continuity of Building Envelope, Full Height Partitions, and Fire Rated Construction:
1. Continuity of Building Envelope:
   a. All materials such as exterior sheathing, membrane flashings, vapor barriers, insulations, damp proofing, waterproofing, roofing, flashings, etc. and all penetrations, holes, gaps, joints, and openings through such materials shall be sealed to ensure continuity of building envelope, whether indicated or not.
   b. Refer instances of uncertainty to Architect for clarification before proceeding with work.
2. Full Height Partitions:
   a. All full height partitions shall be from floor to bottom of deck structure and shall be made to fit around steel joists, beams, etc., whether indicated or not.
   b. Seal joints at top of partitions, in flutes of steel deck, and around structural elements with a compressible filler and/or sealant to accommodate movement due to expansion, contraction, and deflection, whether indicated or not. Treat seals in joints of fire rated partitions as specified below for fire rated construction, whether indicated or not.
   c. Refer instances of uncertainty to Architect for clarification before proceeding with work.

3. Fire Rated Construction:
   a. All seals in fire rated construction, whether at top, bottom, or penetrations through fire rated construction, shall be made with firestopping and fire safing materials to maintain fire rating integrity of construction and satisfy authorities having jurisdiction, whether indicated or not.
   b. Refer instances of uncertainty to Architect for clarification before proceeding with work.

C. Plumbing Line Protection:
1. Placing or washing materials, including, but not limited to the following, down any plumbing line or fixture is strictly forbidden.
   a. Concrete, cement, sludge, mortar, grout, plaster, or any other cementitious material
   b. Paint, paint thinner, turpentine, kerosene, gasoline, oil, or any other petroleum or hazardous products.
2. Cleaning painting equipment, including brushes in new or existing plumbing fixtures is strictly prohibited.
3. If requested, Contractor shall certify that all affected plumbing lines and fixtures are clean, free flowing and running. Plumbing lines and fixtures damaged as a result of any of the above shall be repaired or replaced at no expense to Owner. Contractor shall bear responsibility and all costs of fines, penalties, and legal fees attributed to violations as levied by authorities having jurisdiction.

D. Hanging Items from Deck and Structure: Ducts, pipes, conduits, equipment, and other items indicated to be supported from the structure shall be accomplished using approved hang wires, hangers, or devices of type, size and material recommended to suit the application and installed in accordance with recommendations of the hanger or device

manufacturer, Architect and/or Structural Engineer, or code authorities having jurisdiction, whichever is the more stringent requirement. Nothing shall be hung from the deck and structure unless directed to do so by the Architect and/or Structural Engineer. Powder activated devices in metal deck are not permitted.

E. Ducts, Pipes, Conduits, and Wires: Shall be concealed in walls, chases, and enclosed areas out of view, unless specifically indicated as exposed or where exposure is required for proper function of item, such as air registers, air returns, louvers, grilles, vents, thermostats, electrical receptacles, telephone/data terminals and jacks, light switches, etc. Refer instances of uncertainty to Architect for clarification before proceeding.

F. Fasteners:
1. Unless specifically indicated or directed otherwise, all fasteners in work exposed to view, shall be concealed in the finished work.
2. No fasteners shall show through or telegraph through exposed face of finished work and all finished surfaces shall be free of all evidence of the existence of fasteners.
3. Fasteners shall be spaced to accurately and rigidly secure work in place.
4. If not shown or otherwise required or recommended by manufacturer, standard, or code authorities having jurisdiction, fastener spacing shall not exceed 12 inches on center.
5. Non-conforming work shall be removed from the site and replaced with new conforming work at no additional expense to Owner.

G. Exposed Metal Work:
1. Unless specifically indicated or directed otherwise, all exposed metal work shall be flat with all surfaces free of distortions, oil canning, waves, dents, scratches, weld marks, and other surface defects detrimental to good appearance or function.
2. All steel exposed to exterior weather or moisture, either exposed or concealed in work, shall be hot-dip galvanized, phosphate treated for paint retention and shop prime painted.
3. Non-conforming work shall be removed from the site and replaced with new conforming work at no additional expense to Owner.

H. Continuous Date and Time Code Operated Devices:
1. Devices used in the construction of this Project which use continuous date and time codes in their operation, whether software or hardware, and whether upgradable or not, including, but not limited to air handling, lighting, alarm, communication, security, and instrumentation systems, elevators, escalators and other conveying systems, shall be Y2K compliant. In addition, such devices shall remain compliant for 100 years or the life of the device, whichever comes first.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 014200 - DEFINITIONS AND TERMINOLOGY

PART 1- GENERAL

1.1. SPECIFICATION TERMINOLOGY

A. "Engineer" the Consulting Engineering Firm under contract with the Owner for this particular project, or its designated representative.

B. "Furnish" means to supply, deliver and unload materials and equipment at the project site ready to install.

C. "Install" means the operations at the project site including unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, training and similar operations required to prepare the materials and equipment for use, verify conformance with Contract Documents and prepare for acceptance and operation by the Owner.

D. "Provide" means to furnish and install materials and equipment.

E. "Perform" means to complete the operations necessary to comply with the Contract Documents.

F. "Indicated" means graphic representations, notes, or schedules on drawings, or other requirements in Contract Documents. Words such as "shown", "noted", "scheduled", are used to help locate the reference. No limitation on the location is intended unless specifically noted.

G. "Specified" means written representations in the bid documents or the technical specifications.

H. "Regulation" means laws, statutes, ordinances, and lawful orders issued by authorities having jurisdiction, as well as, rules, conventions, and agreements within the construction industry that control performance of work, whether they are lawfully imposed by authorities having jurisdiction or not.

I. "Installer" means an entity engaged by Contractor, either as an employee, subcontractor, or sub-subcontractor to install materials and/or equipment. Installers are to have successfully completed a minimum of five projects similar in size and scope to this project, have a minimum of five years of experience in the installation of similar materials and equipment, and comply with the requirements of the authority having jurisdiction.

J. "Manufacturer" means an entity engaged by Contractor, as a subcontractor, or sub-subcontractor to furnish materials and/or equipment. Manufacturers are to have a minimum of five years experience in the manufacture of materials and equipment similar in size, capacity and scope to the specified materials and equipment.

K. "Project site" means the space available to perform the work, either exclusively or in conjunction with others performing construction at the project site.

L. "Testing laboratory" means an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report and interpret the results of those inspections or tests.

M. "Listed" means equipment is included in a list published by a nationally recognized laboratory which makes periodic inspection of production of such equipment and states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

N. "Labeled" means equipment that embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc. and production is periodically inspected in accordance with nationally recognized standards or tests to determine safe use in a specified manner.

O. "Certified" used in context with materials and equipment means the material and equipment has been tested and found by a nationally recognized testing laboratory to meet specification requirements, or nationally recognized standards if requirements are not specified, and is safe for use in the specified manner. A nationally recognized testing laboratory must periodically inspect production of the equipment and the equipment must bear a label, tag, or other record of certification.

"Certified" used in context with labor performance or ability to install materials and equipment means that the abilities of the proposed installer have been tested by an representative of the specified testing agency authorized to issue certificates of competency and has met the prescribed standards for certification.

"Certified" used in context with test reports, payment requests or other statements of fact means that the statements made on the document are a true statement as attested to by the certifying entity.

1.2 SPECIFICATION SENTENCE STRUCTURE

A. Specifications are written in modified brief style. Requirements apply to all work of the same kind, class, and type even though the word "all" is not stated.

B. Simple imperative sentence structure is used which places a verb as the first word in the sentence. It is understood that the words "furnish", "install", "provide", or similar words include the meaning of the phrase "The Contractor shall." before these words.

C. It is understood that the words "directed", "designated", "requested", "authorized", "approved", "selected", or similar words include the meaning of the phrase "by the Engineer" after these words unless otherwise stated. Use of these words does not extend the Engineer's responsibility for construction supervision or responsibilities beyond those defined in the General Conditions.

D. "At no additional cost to Owner", "With no extra compensation to Contractor", "At Contractor's own expense", or similar words mean that the Contractor will perform or provide specified operation of work without any increase in the Contract Amount. It is understood that the cost for performing all work is included in the amount bid and will be performed at no additional cost to the Owner unless specifically stated otherwise.

1.3 DOCUMENT ORGANIZATION

A. Organization of Contract Documents is not intended to control or to lessen the responsibility of the Contractor when dividing work among subcontractors, or to establish the extent of work to be performed by any trade, subcontractor or vendor. Specification or details do not need to be indicated or specified in each specification or drawing. Items shown in the contract documents are applicable regardless of location in the Contract Documents.

B. Standard paragraph titles and other identifications of subject matter in the specifications are intended to aid in locating and recognizing various requirements of the specifications. Titles do not define, limit, or otherwise restrict specification text.

C. Capitalizing words in the text does not mean that these words convey special or unique meanings or have precedence over other parts of the Contract Documents. Specification text governs over titling and it is understood that the specification is to be interpreted as a whole.
D. Drawings and specifications do not indicate or describe all of the work required to complete the project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer. Provide any work, materials or equipment required for a complete and functional system even if they are not detailed or specified.

1.4 INTERPRETATIONS OF DOCUMENTS

A. Comply with the most stringent requirements where compliance with two (2) or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, unless Contract Documents indicate otherwise.

1. Quantity or quality level shown or indicated shall be minimum to be provided or performed in every instance.
2. Actual installation may comply exactly with minimum quality indicated, or it may exceed that minimum within reasonable limits.
3. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for context of requirements.
4. Refer instances of uncertainty to the Engineer for a decision before proceeding.

B. Provide materials and equipment comparable in quality to similar materials and equipment incorporated in the project or as required to meet the minimum requirements of the application if the materials and equipment are shown in the drawings but are not included in the specifications.

1.5 REFERENCE STANDARDS

A. Comply with applicable construction industry standards as if bound or copied directly into the Contract Documents regardless of lack of reference in the Contract Documents. Apply provisions of the Contract Documents where Contract Documents include more stringent requirements than the referenced standards.

1. Standards referenced directly in the Contract Documents take precedence over standards that are not referenced but recognized in the construction industry as applicable.
2. Comply with standards not referenced but recognized in the construction industry as applicable for performance of the work except as otherwise limited by the Contract Documents. The Engineer determines whether code or standard is applicable, or which of several are applicable.

B. Consider a referenced standard to be the latest edition with supplements or amendments when a standard is referred to in an individual specification section but is not listed by title and date.

C. Trade association names and title of general standards are frequently abbreviated. Acronyms or abbreviations used in the Contract Documents mean the recognized name of trade association, standards generating organization, authority having jurisdiction, or other entity applicable in the context of the Contract Documents. Refer to "Encyclopedia of Associations," published by Gale Research Company.

D. Make copies of reference standards available as requested by Engineer or Owner.

1.6 SUBSTITUTIONS AND EQUAL PRODUCTS

Provide materials and equipment manufactured by the entities specifically listed in each technical specification section. Submit a Contractor's Modification Request for substitution of materials and equipment of manufacturers not specifically listed or for materials and equipment that does not strictly comply with the Contract Documents.

Contractor may provide "equal" products manufactured by manufacturers other than those specifically listed in the technical specification section unless it is specifically stated that only the materials and equipment of the specified manufacturers shall be provided. Provide a request for approval of proposed equals for any materials or equipment not specifically listed. Submit a Contractor's Modification Request for substitution of materials and equipment of other manufacturers or for materials and equipment that does not strictly comply with the Contract Documents. A Field Order or Change Order will be issued if the contract modification is approved.

END OF SECTION 014200

SECTION 01 45 00

QUALITY CONTROL

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Quality Assurance: Requirements for material and product quality and control of installation.

B. Tolerances

C. References and Standards

D. Mock-ups

E. Testing Laboratory Services

F. Inspection Services

G. Manufacturers' field services

1.2 RELATED SECTIONS

A. Section 01 41 00 – Regulatory Requirements

B. Section 01 45 23 – Testing and Inspecting Services

C. Section 01 33 00 - Submittal Procedures

D. Section 02 32 00 - Geotechnical Report

E. The Work of this Section shall be included as a part of all Sections of Work, whether referenced therein or not.

1.3 DESCRIPTION OF REQUIREMENTS

A. Unless specifically noted otherwise, perform all Work shown, mentioned, or reasonably inferred and comply with all work restrictions.

B. Many of the requirements specified elsewhere are included herein for reference and convenience. Where a conflict occurs between the Contract Documents, either within themselves or each other, the more stringent requirement or the most expensive combination of materials and workmanship shall prevail.

C. Contractor shall:
1. perform Work in accordance with the General Conditions, as specified herein, and with the quality control requirements of each Specification Section;
2. perform Work in the highest quality workmanship, unless specified otherwise;
3. join materials with a uniform and accurate fit so they meet with neat straight lines, free of smears, overlaps or irregularities, as applicable to the work;
4. install all exposed materials appropriately level, plumb, and at accurate angles as shown and flush with adjoining materials;

5. attach materials with sufficient strength, and with number and spacing of fasteners and attachments that will not fail until materials joined are broken or permanently deformed;
6. use concealed fasteners, unless shown or directed otherwise.

1.4 QUALITY ASSURANCE AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step-in sequence.

C. Should manufacturer’s instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.5 TOLERANCES

A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.6 REFERENCES AND STANDARDS

A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Owner-Contractor Agreement except where specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

E. Neither contractual relationships, duties, responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

F. Refer to Section 01 41 00, Codes, Regulations and Standards, for additional information concerning applicable reference and standards requirements.

1.7 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be the comparison standard for remaining Work.

D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Architect.

E. Mock-up may be approved in phases as portions are completed.

F. Project Mock-up Requirements: Provide an actual sample panel with the following properties:
1. Size: Minimum 6 feet wide by 8 feet tall. Size may vary according to specific project requirements. Brace and support as required to withstand structural wind loads.
2. Materials: actual exterior finishes including, but not limited to face brick, cast stone, and plaster, actual building materials and assemblies indicating brick patterns on masonry and stud back-up as occurs with damp proofing and flashing as detailed, actual portion of aluminum storefront indicating jam, sill and head attachment and flashing details, and where appropriate, provide mock-up of special finish details, insets and reliefs, reveals, expansion and control joints, brick ledges, brick head and sills, pipe penetrations and waterproofing materials. Provide roof edge flashing and gutter section (as applicable) in pre-finished color as selected by Architect to cap the mock-up panel. Include a sealant joint at least 16 inches long.
3. Drawing: Refer to mock-up diagram on Drawings for minimum project requirements. Mock-up drawing is for reference only. Actual mock-up drawing will be submitted by the Architect after submittals have been approved.

1.8 TESTING SERVICES

A. Owner will appoint, employ, and pay for specified services of an independent firm to perform testing.

B. The independent firm will perform tests and other services specified in individual specification sections and as required by the Architect/Engineer, Owner, or authority having jurisdiction.

C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Owner, Architect/Engineer, and Contractor, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify Architect/Engineer and independent firm 48 hours prior to expected time for operations requiring services, or as specified in individual specification sections.
2. Make arrangements with independent firm and pay for additional samples and tests required.

F. Testing does not relieve Contractor to perform Work to contract requirements.

G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.

H. Refer to Section 01 45 23, Inspection and Testing Laboratory Services, for additional information concerning testing, and submittal procedures and requirements for Testing Reports.

1.9 INSPECTION SERVICES

A. Owner will appoint, employ, and pay for specified services of an independent firm to perform inspection.

B. The independent firm will perform inspections and other services specified in individual specification sections and as required by the Architect/Engineer, Owner, or authority having jurisdiction.

C. Inspecting may occur on or off the project site. Perform off-site inspecting as required by the Architect/Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Owner, Architect/Engineer, and Contractor, indicating inspection observations and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish safe access and assistance by incidental labor as requested.
1. Notify Architect/Engineer and independent firm 48 hours prior to expected time for operations requiring services, or as specified in individual specification sections.

G. Inspecting does not relieve Contractor to perform Work to contract requirements.

H. Refer to Section 01 45 23, Inspection and Testing Laboratory Services, for additional information concerning inspections, and submittal procedures and requirements for Inspection Reports.

1.10 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as required, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer within ten (10) days after receipt of Notice to Proceed, in advance of required observations. Observer subject to approval of Architect/Engineer and Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 01 33 00, Submittal Procedures, for additional information concerning submittal procedures and requirements for Manufacturers Field Reports.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION

SECTION 01 45 23

TESTING AND INSPECTING SERVICES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. A qualified independent testing laboratory and/or geotechnical engineering service selected and paid by Owner and approved by Architect, will perform professional testing and laboratory services specified herein.

B. Inspecting agency shall make and perform all inspections and tests in accordance with the rules and regulations of the building code, local authorities, Specifications of ASTM, and these Contract Documents.

C. Materials and workmanship not meeting required standards or performance obligations are to be removed and replaced. Replacement and subsequent testing shall be at Contractor's expense.

D. Where terms "Inspector" and "Laboratory" are used, they mean and refer to an officially designated and accredited inspector of the testing laboratory or geotechnical service engaged by Owner.

E. All testing laboratory services will be provided and paid for by the Owner and the Contractor shall be notified as soon as possible.

F. The Owner will pay for the initial laboratory services of materials that comply with the requirements of the Contract Documents. The Contractor shall pay for testing and re-testing of materials that do not comply with the requirements of the Contract Documents.

G. Laboratory inspection shall not relieve the Contractor or Fabricator of his responsibility to furnish materials and workmanship in accordance with the Contract Documents.

H. Contractor or Fabricator shall cooperate with the testing laboratory in all matters pertaining to the work.

1.2 RELATED REQUIREMENTS

A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals or public authorities.

B. Respective Sections of Specifications. Certification of products.

C. Each Specification Section Listed: Inspection and laboratory test required and standards for inspection and testing.

D. Testing laboratory inspection, sampling and testing is required for:
   1. Section 03 30 00 - Cast-In-Place Concrete
   2. Section 04 20 00 - Unit Masonry
   3. Division 5 - Metals: As specified or required for structural steel, open web steel joists, steel deck, miscellaneous metals, etc.

4. Division 7 - Thermal and Moisture Protection: As specified or required for waterproofing and roofing.
5. Division 7 - Fireproofing and Intumescent Paint
6. Section 31 00 00 - Earthwork
7. Section 31 23 23.13- Construction of Underground Utilities
8. Section 31 32 00 - Soil Stabilization: As specified or required by geotechnical report and/or project conditions.
9. Section 31 63 29 - Drilled and Reamed Foundation
10. Section 32 13 13 - Concrete Paving
11. Section 32 12 16 – Hot Mix-Hot Laid Asphaltic Concrete Paving
12. As requested by the Construction Manager/Contractor, Owner, Architect, or Engineer(s).

1.3 QUALIFICATIONS

A. Testing agencies shall meet requirements of ASTM E329, “Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction” and ASTM E543, “Standard Practices for Agencies Performing Non-Destructive Testing”.

B. Testing agencies shall be insured against errors and omissions by a professional liability insurance policy having a minimum limit of liability of $500,000.00.

C. Inspection and testing services of testing agency shall be under the direction of a Registered Engineer licensed in the State of Texas, charged with engineering managerial responsibility, and having a minimum of five (5) years engineering experience in inspection and testing of construction materials.

D. Inspecting personnel monitoring concrete work shall be ACI certified inspectors.

E. Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, “Standard and Guide for Qualification and Certification of Welding Inspectors”. Inspector may be supported by assistant inspectors who may perform specific inspection functions under supervision of the inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). Work of assistant inspectors shall be regularly monitored by the inspector, generally on a daily basis.

F. Testing machines shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards.

1.4 RESPONSIBILITIES OF CONTRACTOR

A. See respective technical sections for specific requirements.

B. Deliver to the laboratory, without cost to Owner, adequate quantities of representative samples of materials proposed for use which are required to be tested.

C. Advise laboratory and Architect sufficiently in advance of construction operations to allow laboratory to complete any required checks or tests and to assign personnel for field inspection and testing as specified.

D. Provide adequate facilities for safe storage and proper curing of concrete test samples on project site for the first 24 hours and also for subsequent field curing as required by ASTM C31.

E. Furnish such nominal labor and equipment as is required to assist laboratory personnel in obtaining and handling samples at the site and in accessing work for inspection.

F. Furnish concrete mix designs, in accordance with ACI 301, Section 3.9, made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, the laboratory shall be selected and paid by the Contractor.

G. Obtain required inspections or approvals of the building official. All inspection requests and notifications required by building code are responsibility of the Contractor.

H. Provide current welder certificates for each welder to be employed.

I. Furnish fabrication/erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6.

J. Prequalification of all welding procedures to be used in executing the work.

1.5 AUTHORITY AND DUTIES OF LABORATORY PERSONNEL

A. A representative of the testing laboratory, who has reviewed and is familiar with the project and specifications, shall participate in all pre-construction conferences. He shall coordinate material testing and inspection requirements with the Contractor and his subcontractors consistent with the planned construction schedule. The laboratory representative shall attend, throughout the course of the project, such conferences as may be required or requested to address quality control issues.

B. Laboratory personnel shall inspect and/or test materials, assemblies, specimens, and work performed, including design mixes, methods and techniques and report to the Architect the progress thereof.

C. If material furnished and/or work performed fails to meet requirements of Contract Documents, laboratory inspector shall promptly notify the Construction Manager, Architect, Engineers, supplier and/or subcontractor providing or preparing the materials or work being tested of such failure.

D. Laboratory technicians do not act as foremen or perform other duties for Contractor. Work will be checked as it progresses, but failure to detect any defective work or materials shall not, in any way, prevent later rejection when such defect is discovered.

E. Laboratory inspector is not authorized to revoke, alter, relax, enlarge, or release any requirement of the Contract Documents or to approve or accept any portion of work, except where such approval is specifically called for in the Specifications.

F. Comply with all building code requirements for “Special Inspection” whether or not such inspections are specified herein.

1.6 SUBMITTALS

A. Submit copies of reports of each and every inspection and test as follows:
   1. Owner, Program or Project Manager, Architect, and each Engineer or outside consultants regarding their particular phase of the project: One (1) each
   2. Construction Manager, if applicable, and Contractor: Two (2) each

B. State in report all details of each inspection and test. Indicate compliance or noncompliance with requirements of Contract Documents. Also, state in report any and all unsatisfactory conditions.

C. In addition to furnishing a written report, notify Construction Manager, if applicable, and Contractor verbally of any uncorrected conditions or failures to comply with requirements of the Contract Documents, and immediately Fax corresponding report to the Architect and Engineer.

D. At completion of each trade or branch of work requiring inspecting and testing, submit a final certificate attesting to satisfactory completion of work and full compliance with requirements of Contract Documents.

E. Submit copies of test results, sealed by a Registered Engineer, to municipal authorities having jurisdiction, as required.

1.7 REFERENCED STANDARDS

A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between these Contract Documents and a referenced standard, the Contract Documents shall govern. In case of conflict between Contract Documents and the Building Code, the more stringent shall govern.

1.8 TESTING LABORATORY GUIDELINES AND PROCEDURES

A. Technicians scheduled to perform specific testing services must be qualified to review and perform other services that overlap, i.e. earthwork, foundation inspections, rebar inspection, and concrete when scheduled concurrently at the Project site.

B. Technician time for services performed will be reimbursed at a regular time rate. Compensation at the overtime rate will be considered for any hours over eight (8) hours spent at the job site on a single day, field testing services performed on a Saturday or Sunday, and any field services performed on a recognized holiday.

C. There will be a three (3) hour minimum for each scheduled testing service. Vehicle charges will be included on a $25.00 per trip basis.

D. Cylinder pick-up will be handled by the technician performing test on a scheduled pick-up day. If there are no testing services scheduled, the cylinder pick-up fee will be $40.00 on week days and $50.00 on weekends and holidays with no technician or vehicle charge.

E. The Contractor shall bear the responsibility of scheduling all of the test services. The Contractor and the testing laboratory shall assume full responsibility to coordinate the testing services. Cancellations and/or failed test will be reimbursable to the Owner by the responsible party for the cancellations or failure of a test or service.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GENERAL

A. Testing services shall include, but not be limited to those specified below or which are necessary or required during course of construction to ascertain specification compliance and which may be deemed necessary by Architect, Engineer, or Owner to ensure the quality of the Work.

B. The Owner reserves the right to add to or delete any or all inspection and testing specified herein.

C. If conflicts arise between Drawings and Specifications, notify Architect immediately. In any case the most stringent requirements shall dictate procedure.

3.2 TESTING OF EARTHWORK

A. Testing Services (As specified or required):
   1. References (As applicable for tests required):
      a. American Society for Testing and Materials (ASTM)
         1) D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3)
         2) D2922, Standard Test Method for Density of Soil and Soil-Aggregate In Place By Nuclear Methods (Shallow Depth)
         3) D4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
      b. American Association of State Highway and Transportation Officials (AASHTO)
         1) T89, Determining the Liquid Limit of Soils
         2) T90, Determining the Plastic Limit and Plasticity Index of Soils
         3) T99, Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305-mm (12-in) Drop
         4) T238, Density of Soil and Soil Aggregates In Place By Nuclear Methods (Shallow Depth)
   2. Perform sieve analysis to develop grain size distribution curves for materials to be used for subgrade, fill under slab-on-grade, and backfills.
   3. Establish the moisture density relation of soils to be used as fill using the method best suited to the type of fill material.
   4. Determine moisture content of all fill materials before placement and advise Contractor when it is or is not suitable to achieve required compaction.
   5. Determine Liquid Limit in accordance with ASTM D4318 or AASHTO T89, Plastic Limit in accordance with ASTM D4318, and Plasticity Index in accordance with ASTM D4318 of all fill material,
   6. Perform one (1) in place density test for each 2,500 square feet (280 square yards) of existing subgrade material.
   7. Perform Moisture-Density curve in accordance with ASTM D698 or AASHTO T99 for one (1) type of fill material. If the original choice of material does not meet the specifications, the Contractor shall pay for additional testing.
   8. Perform in place density tests of each lift of compacted fill at locations adequate to evaluate the degree of compaction of all fill areas. Conduct one (1) test for each 2,500 square feet (280 square yards) of each lift of compacted fill.
   9. Perform testing at a frequency of one in-place density and moisture test for each 75 lineal feet or less of utility trench, with a minimum of three tests per lift

B. Reports: Submit reports with the following information:
   1. Type and condition of soil at footing bottoms.
   2. Level of water table in the excavated areas.
   3. Grain size distribution of fill materials (average of three (3) tests).
   4. Moisture density test results.

5. In place density test results with moisture content and relative density of each layer of compacted fill. Include with in place density test results, a plan showing location of each test.
6. Notify Architect by telephone within one (1) hour of the discovery of the following conditions and follow up telephone notification with written report.
   a. Materials used, or degree of soil compaction not meeting specified requirements.
   b. Frost and freeze protection requirements for excavation bottoms not being complied with.
   c. Water in excavations which is not being removed prior to work being performed in excavation.

3.3 INSPECTION OF PIPED SITE UTILITIES

A. Laboratory representative shall observe and report on the following:
   1. Proper alignment and grade of trenches.
   2. Pipe bedding and supports.
   3. Pipe, joints, jointing material, and thrust blocks prior to installation of pipe.
   4. Installation of pipe and joints.
   5. Testing of piped utilities performed by Contractor.

3.4 PAVING

A. Testing Services:
   1. Perform field tests for moisture density properties:
      a. Provide field testing of the sub-grade as described in Paragraph 3.2, A, above.
      b. Paving sub-base, provide one (1) field test for every 5,000 square feet of area of crushed limestone or caliche sub-base, if any.
      c. Lime treated sub-grade, provide one (1) field test for every 5,000 square feet of area of lime treated sub-grade, if any, for content of lime and sub-grade compaction.
      d. Cement soil stabilization, if any, provide one (1) field test for every 5,000 square feet of area of cement stabilized sub-grade for content of cement and sub-grade compaction.

3.5 PIER DRILLING OPERATION

A. A representative of a qualified geotechnical laboratory shall provide services herein specified.

B. Laboratory representative shall make continuous inspections to determine that proper bearing stratum is obtained and utilized for bearing and that shafts are properly clean and dry before placing concrete.

C. Laboratory shall furnish complete pier log showing the diameter, top and bottom elevations of each pier, casing required or not required, actual penetration into bearing stratum, elevation of top of bearing stratum, volume of concrete used, and deviations from specified tolerances.

D. Laboratory representative shall make continuous inspections of drilled pier construction to check the following:
   1. Verify soundness of bearing stratum and desired penetration.
   2. Verify pier dimensions and reinforcing used.
   3. Monitor condition of hole and removal of water and loose material from bottom.

4. Monitor placement of concrete and use of tremie or pumps.
5. Monitor the extraction of casing, if used.

E. Request probe holes when deemed necessary to confirm safe bearing capacity.

3.6 CONCRETE REINFORCING STEEL AND EMBEDDED METAL ASSEMBLIES

A. Inspect all concrete reinforcing steel prior to placing concrete for compliance with Contract Documents and approved shop drawings. All instances of noncompliance with Contract Documents and approved shop drawings shall be immediately brought to the attention of the Contractor for correction and then, if uncorrected, reported to the Architect.

B. Laboratory representative shall observe and report on the following:
1. Number and size of bars.
2. Bending and lengths of bars.
3. Splicing.
4. Clearance to forms, including chair heights.
5. Clearance to sides and bottom of trench if soil formed.
6. Clearance between bars or spacing.
7. Rust, form oil, and other contamination.
8. Grade of steel.
9. Securing, tying, and chairing of bars.
10. Excessive congestion of reinforcing steel.
11. Installation of anchor bolts and placement of concrete around such bolts.
12. Fabrication and installation of embedded metal assemblies, including visual inspection of all welds.
13. Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with Contract Documents. Check number, spacing and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular stud or bar, such stud or bar shall be struck with a hammer and bent 15 degrees off perpendicular and then bent back into position. Anchors failing this test shall be replaced.

C. Provide a qualified, experienced inspector to inspect reinforcing steel. Inspector shall have a minimum of three (3) years experience inspecting reinforcing steel in projects of similar size.

3.7 CONCRETE INSPECTION AND TESTING

A. Receive and evaluate all proposed concrete mix designs submitted by Contractor. If mix designs comply with Drawings and Specifications, the laboratory shall submit a letter to the Architect certifying compliance. Mix designs not complying with Drawings and Specifications shall be returned by the laboratory as being unacceptable. Check the proposed mixes for proportions, water cement ratio and slump in accordance with ACI 613 and 318.

B. Comply with ACI 311, “Guide For Concrete Inspection” and ACI “Manual of Concrete Inspection” (SP-2).

C. Sample and test concrete placed at the job site in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis.

D. All concrete shall be tested as follows:
1. Mold and cure four (5) specimens from each sample.

a. for each 50 cubic yards or fraction thereof of structural building concrete; and
b. for each 100 cubic yards or fraction thereof of non-structural concrete and site work paving and sidewalks.
c. Laboratory cure two (2) cylinders in accordance with ASTM C192.
d. Field cure remaining cylinders in accordance with ASTM C31.

2. TWO (2) specimens shall be tested at seven (7) days for information, two (2) shall be tested at 28 days for acceptance, and
3. Store one (1) cylinder for testing at 56 days in the event the 28 days strength tests do not meet strength requirements.

E. All deviations from the requirements of ASTM Specifications shall be recorded in the test report. Test concrete specimens in accordance with ASTM C39.

F. Specimens for pumped concrete shall be taken at the discharge end of pumping equipment.

G. Supervise curing and protection provided for test specimens in field, and transportation from the field to laboratory. Test cylinders shall be stored in the field 24 hours and then carefully transported to laboratory and cured in accordance with ASTM C31.

H. Make one (1) strength test (four (4) cylinders) of each mix design of concrete placed in any one (1) day.

I. Make one (1) slump test for each set of cylinders following procedural requirements of ASTM C143 and ASTM C172. Make additional slump tests whenever consistency of concrete appears to vary. Slump tests corresponding to samples from which strength tests are made shall be reported with strength test results. Other slump tests need not be reported.

J. Determine total air content of air entrained normal-weight concrete sample for each strength test in accordance with ASTM C231.

K. Determine air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567.

L. Determine temperature of concrete sample for each strength test.

M. Inspect each batch of concrete, monitor addition of mixing water to assure uniform consistency from truck to truck. Check mixing form mixers before mix begins to set and within time limits set forth in ASTM C94.
1. Monitor addition of water and high-range water reducer to concrete at job site and length of time concrete is allowed to remain in truck during placement.

N. Testing agency shall furnish and maintain a competent inspector at the mixing plant at the start of each day's mixing. Inspector shall examine concrete materials for compliance with Specifications and approved mix design, weighing and measuring devices, proportioning and mixing of materials, water and cement content of each batch, general operation of the plant, and transportation of concrete to jobsite. Inspector shall verify that amount of free surface moisture contained in fine and course aggregate has been properly accounted for in the concrete mixing to achieve required consistency and water cement ratio.

O. Testing laboratory shall monitor addition of water to concrete at the jobsite and the length of time concrete is allowed to remain in the truck before placement. Inspector shall compare mixture with criteria on the approved mix design and report any significant deviation to the

Architect, Contractor and concrete supplier. Do not permit addition of water which will exceed maximum water/cement ratio for the mix as given on the approved mix design.

P. Observe placing of all concrete, except non-structural slabs-on-grade and site work. Observe and report on placing method, consolidation, cold joints, length of drop, and displacement of reinforcement. Report deficiencies to Contractor immediately for corrective action. Inspections may be reduced to a periodic basis when all procedures have been deemed satisfactory by the laboratory.

Q. Test reports shall include but no be limited to the following information: date of concrete placement, concrete mix identification number or proportion of ingredients, truck ticket number, time test was made, time of batching, location of each placement, slump, unit weight, water content (microwave test) and air content of concrete sampled and date and results of strength test.

R. Report promptly to Architect all details of reasons for rejection of any and all quantities of concrete. Give all information concerning locations of the concrete pours, quantities, date of pours, and other pertinent facts concerning concrete represented by the specimens.

S. Testing laboratory shall certify each delivery ticket indicating class of concrete delivered (or placed), amount of water added and time at which cement, and aggregate were dispensed into the truck, and time at which concrete was discharged from the truck.

T. Evaluation and Acceptance:
1. If measured slump, or air content of air entrained concrete, falls outside specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, concrete shall be considered to have failed to meet the requirements of the specifications and shall not be used in the structure.
2. Strength level of concrete will be considered satisfactory if the averages of all sets of three (3) consecutive strength tests results are equal to, or exceed, specified strength and no individual test result (average of two (2) cylinders) is below specified strength by more than 500 psi.
3. Completed concrete work will be accepted when requirements of “Specifications for Structural Concrete for Buildings”, ACI 301, Chapter 18, have been met.

U. Concrete Test Reports:
1. Reports shall be made and distributed immediately after respective tests or inspections are made.
2. Where reports indicate deviations from Contract Documents, they shall also include a determination of the probable cause of deviation and where applicable, a recommendation for corrective action.

V. Furnish a statistical analysis for each class of concrete placed on the project in accordance with ACI 214 and ACI 318. Information shall be updated and distributed once a month as directed by the Architect. Information shall include, but not be limited to, the following:
1. Strength tests at seven (7) days.
2. Strength tests at 28 days of two (2) cylinder averages.
3. 28-day moving average strength tests of last three (3) test groups.
4. Standard deviation and coefficient of variation based on 28-day strength tests.
5. Average strength and number of 28 days tests for most recent month.
6. Strength test one (1) cylinder at 56 days in the event the 28 days strength tests do not meet strength requirements.

W. Test Footings (Shafts) (Piers) (Caissons): Same diameter and type as specified for other footings, placed in same manner. Accepted test footings may be used in the Work.

X. Non-Compliant Test Reports: All test reports indicating non-compliance should be faxed immediately to all parties on the test report distribution list. Copies shall be on different colored paper.

Y. Inspect application of curing compound and monitor all curing conditions to assure compliance with specification requirements. Report curing deficiencies to the Contractor immediately and submit a written report to the Architect.

3.8 TESTING OF NON-SHRINK GROUT

A. Make one (1) strength test for all plates grouted and for all grout used in joints between members.

B. Each test shall consist of four (4) cubes, two (2) to be tested at seven (7) days and two (2) at 28 days, made and tested in accordance with ASTM C109, with the exception that grout shall be restrained from expansion by a top plate.

3.9 STRUCTURAL STEEL

A. Inspect structural steel during and after erection for conformance with Contract Documents and shop drawings. Review and report on fabricator's quality control procedures and capabilities.

B. Field Inspection:
1. Proper erection of all pieces.
2. Proper touch up painting of all shop primed structural steel exposed to view or in a crawl space.
3. Proper installation of all bolts.
4. Plumbness of structure and proper bracing.
5. Proper field painting.
6. Initial inspection of welding process and periodically thereafter, as necessary.
7. Visual examination of all completed welds.
8. Ultrasonic testing of all penetration field welds.
9. Installation of field welded shear studs.
10. Inspect all shop fabricated members, upon their arrival at the jobsite, for defects incurred during transit and handling.
11. Measure and record camber of all beams upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Members outside specified camber tolerance shall be returned to shop for correction.

C. Qualifications of Welders: Fabricator and erector shall provide the testing laboratory with names of welders to be employed on work, along with certification that each welder has passed qualification tests within the last 12 months, using procedures covered in AWS D1.1, "Structural Welding Code - Steel", latest edition. Verify all welder qualifications.

D. Inspection of field welding shall include the following:
1. Visually inspect fillet welds for size, soundness, and proper return around ends. Check for seams, folds, and delaminations.
2. Visually inspect all welds for proper repair of painting.
3. Ultrasonically test all penetration welds in accordance with ASTM E164.

4. Inspect surfaces to be welded. Surface preparations, fit-up and cleanliness of surface shall be noted. Electrodes shall be checked for size, type and condition.
5. Welding inspector shall be present during alignment and fit-up of members being welded, and shall check for correct surface preparation of root openings, sound weld metal, and proper penetration in the root pass. Where weld has not penetrated completely, inspector shall order the joint to be chipped down to sound metal, or gouged out, and re-welded. Root passes shall be thoroughly inspected for cracks. All cracks shall be gouged out and re-welded to two (2) inches beyond each end of crack.
6. Inspector shall check that all welds have been marked with welder's symbol and shall mark welds requiring repairs and shall make a re-inspection. Inspector shall maintain a written record of all welds. Work completed and inspected shall receive an identification mark by the inspector. Unacceptable material and work shall be identified by word "reject" or "repair" marked directly on the material.
7. Testing agency shall advise the Owner and Architect of any shop and/or field conditions which, in his opinion, may require further tests and examination by means other than those specified. Such further tests and examinations shall be performed as authorized by the Owner and Architect.
8. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of all welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.
9. Weld quality to comply with the American Institute of Steel Construction Manual of Steel Construction.
10. Percentage of weld tested will be determined by the number of welds that fail the initial testing.
11. All welds that fail shall be re-welded and re-tested until they pass. Test two (2) additional welds for every weld failure at the Contractor's expense.

E. Inspection of bolted construction shall be in accordance with AISC "Specification for Structural Steel Buildings" as follows:
1. All bolts shall be visually inspected to ensure that plies have been brought into snug contact.
2. High strength bolting shall be inspected in accordance with Section 9 of the "Specifications for Structural Joints Using ASTM A325 or A490 Bolts".

F. Inspection of stud welding shall be in accordance with Section 7.8, of the AWS D1.1, Structural Welding Code, and as follows:
1. Minimum of two (2) shear studs shall be welded at the start of each production period in order to determine proper generator, control unit and stud welder setting. These studs shall be capable of being bent 45 degrees from vertical without weld failure.
2. When temperature is below 32 degrees F, one (1) stud in each 100 shall be tested after cooling. Studs shall not be welded below 0 degrees F or when surface is wet with rain or snow. If stud fails in the weld, two (2) new studs shall pass the test before resumption of welding.
3. Visually inspect studs for compliance with Contract Documents. Check, number, spacing, and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular stud, such stud shall be struck with a hammer and bent 15 degrees off perpendicular in the direction away from the missing weld. Studs failing under this test shall be replaced.

3.10 REINFORCING STEEL MECHANICAL SPLICES

A. Inspection and Observation Services:
   1. Visually inspect and report on the completed condition of each mechanical splice of reinforcing steel.
   2. Each mechanical splice shall be visually inspected to ensure compliance with the I.C.B.O. Reports and the manufacturer's published criteria for acceptable completed splices.
   3. Special emphasis shall be placed on inspection of the end preparation of each bar to be spliced, as required by the I.C.B.O. Report.

B. Reports: Submit reports to Architect with the following information:
   1. Submit copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.
   2. Reports on each mechanical splice shall indicate location of the splice, size of bars spliced, and acceptability or rejection of splice. Reasons for rejection shall be shown on each report.

3.11 OPEN WEB JOISTS AND JOIST GIRDERS

A. Inspect all joists at jobsite for conformance with specified fabrication requirements. Check welded connections between web and chord, splices, and straightness of members.

B. Inspect installation of joists at jobsite. Check connections to supporting members, chord extensions, number of rows of bridging, and bridging connections for conformance with Contract Documents and referenced standards.

C. Check welder qualification certificates for both shop and field welding operators.

3.12 METAL FLOOR DECK

A. Field inspection shall consist of the following:
   1. Checking types, gauges and finishes for conformance with Contract Documents and shop drawings.
   2. Examination of composite floor deck exposed to crawl space, for damage to galvanizing due to welding or other construction activities. Galvanized composite floor deck shall be repaired in accordance with these specifications.
   3. Examination for proper erection of all metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting or other coating.
   4. Certification of welders.
   5. Field welded shear studs used to fasten metal floor decking to supporting steel shall be inspected and tested as described in the paragraph addressing structural steel.

3.13 METAL ROOF DECK

A. Field inspection shall consist of the following:
   1. Checking types, gauges and finishes for conformance with Contract Documents and shop drawings.
   2. Examination for proper erection of all metal deck, including fastenings at supports and side laps, reinforcing of holes, and miscellaneous deck supports.
   3. Certification of welders.
   4. Visual inspection of at least 25 (twenty-five) percent of all welds.

3.14 SPRAYED FIREPROOFING

A. Verify that applied thickness, density, and bond strength of sprayed fireproofing meets fire rating requirements of approved design.

B. Verify that installation meets fire rating requirements of approved design.

C. Inspect and test for thickness as follows:
   1. Test twenty-five (25) percent of structural frame columns and beams in each building level.
   2. Test ten (10) percent of beams other than structural frame in each building level.
   3. Test one (1) slab per 5,000 square feet of building area.

D. Inspection and test procedures in accordance with ASTM E605 and E736.

3.15 EXPANSION BOLT INSTALLATION

A. Inspect drilling of each hole and installation of each expansion bolt for conformance with Contract Documents and shop drawings.

B. Verify installation torque for each expansion bolt for compliance with manufacturer's installation instructions.

3.16 LIGHTWEIGHT INSULATING CONCRETE FILL

A. Inspection and Observation Services (As required):
   1. Inspection of roof deck prior to start of work.
   2. Inspection during installation of insulation and lightweight insulating concrete fill work to ascertain compliance with Contract Documents.
   3. Observation of base ply fastener pull tests performed by Contractor to ascertain minimum withdrawal resistance of 40 pounds per fastener.

B. Testing Services (As required):
   1. References (As applicable for tests required):
      a. American Society for Testing and Materials (ASTM)
         1) C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties By Means of the Guarded-Hot-Plate Apparatus
         2) C495, Test Method for Compressive Strength of Lightweight Insulating Concrete
         3) C578, Specification for Rigid, Cellular Polystyrene Thermal Insulation
   2. Test EPS insulation board for thermal insulation value in accordance with ASTM C177.
   3. Test lightweight insulating concrete fill in accordance with ASTM C495 for:
      a. Mix design compressive strength.
      b. Mix design wet and dry density range.
      c. Number of Tests:
         1) One (1) per 5,000 square feet
         2) Not less than one (1) for each day's work
   4. Test EPS insulation board for density in accordance with ASTM C578.

3.17 TESTING OF ROOFING

A. Inspection and Observation Services (As required):
   1. Inspection of roof deck prior to start of work.
   2. Inspect on-site condition of stored roofing materials.
   3. Inspection during roofing, roof insulation, and sheet metal work to ascertain compliance with Contract Documents.
   4. Observation of roof test cuts performed by Contractor to ascertain that they are properly made.
   5. Observation of patching of roof test cuts to ascertain that they are properly made.

B. Testing Services (As required):
   1. Perform dissection and analysis on cuts provided by Contractor to confirm number of plies, bonding of plies, weight of bitumen and softening temperature to ascertain compliance with specifications.

3.18 MASONRY

A. Inspection and Observation Services:
   1. Inspection of placement of reinforcement including condition, grade, size, location, spacing, and lap splices.
   2. Review mortar design mixes.
   3. Inspection of laying, mortaring, and grouting of concrete masonry units and elements.

B. Testing Services:
   1. References (As applicable for tests required):
      a. ASTM International (ASTM)
         1) C140, Standard Test Methods of Sampling and Testing Concrete Masonry Units
         2) C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
         3) C1019, Standard Test Method for Sampling and Testing Grout
         4) E447-97, Standard Test Methods for Compressive Strength of Laboratory Constructed Masonry Prisms
   2. Testing of Concrete Masonry Units (CMU):
      a. Preconstruction: Perform the following tests in accordance with ASTM C140.
         1) Compressive Strength
         2) Absorption
         3) Weight
         4) Moisture Content
         5) Dimensions
   3. Mortar Tests:
      a. Preconstruction: Perform the following tests in accordance with ASTM C780 on each type of mortar mix used on the Project.
         1) 28 Day Compressive Strength
         2) Water Retention
      b. Construction: Perform 28-day compressive strength test in accordance with ASTM C780 on each type of mortar mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
   4. Refer to and include work for reinforcing steel specified in Paragraphs 3.5 and 3.6 above.

5. Grout Tests:
   a. Preconstruction: Perform the following tests in accordance with ASTM C1019 on each type of grout mix used on the Project.
      1) Slump Test
      2) 28 Day Compressive Strength
      3) Construction: Perform 28-day compressive strength test in accordance with ASTM C1019 on each type of grout mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
      4) Prism Test: Perform preconstruction 28-day compressive strength test on concrete masonry walls in accordance with ASTM E447-97, Method B.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Specific administrative and procedural minimum actions are specified in this Section, as extensions of provisions in other Contract Documents. These requirements have been included for special purposes as indicated. Nothing in this Section is intended to limit types and amounts of temporary work required, and no omission from this Section will be recognized as an indication that such temporary activity is not required for successful completion of the Work and compliance with requirements of the Contract Documents. Provisions of this Section are applicable to, but are not limited to the temporary power, temporary water, temporary heat, field office, mobile telephone, sanitary facilities, storage facilities, signs, barriers, security, construction fence, cleaning, first aid facilities, fire protection, construction aids, parking facilities, storm water control and pollution prevention plan, as further expanded in this Section.

1.2 JOB CONDITIONS

A. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the Work. Terminate use and remove facilities at earliest reasonable time, when no longer required or when permanent facilities have, with authorized use, replaced their need.

B. Conditions of Use:
   1. Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary, and protective of persons and property, and free of deleterious effects.
   2. Be responsible for overloading or excess use of or damage resulting from the overloading or excess use of existing utilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials, not specifically described herein, but required for proper completion of Work of this Section, may be new or used as selected by the Contractor, but shall be of design, type, size, and strength recommended to suit intended purpose.

B. Items required to protect the tenants, workmen, and public from danger, shall be sufficiently designed to protect them. Where required, exclude the public from all hazards.

PART 3 - EXECUTION

3.1 UTILITIES

A. Temporary Power: Provide temporary power and all wiring, lamps, distribution of power, and equipment required for construction, inspection and testing of Work.

B. Temporary Water: Provide temporary water and all hoses and equipment required for construction, inspection and testing of Work.

C. Temporary Climate Control: Provide temporary climate control (heating, cooling and humidity control) required for construction of Work.
   1. Provide heat to prevent freezing and to avoid damage to materials in storage, during and after installation, and during curing and drying of materials and finishes. Provide and maintain such dependable source of supply of heat, cooling, and humidity control as necessary until the Work is accepted. No open fire heaters will be permitted. No mold, mildew, rust, or sagging materials due to humidity will be allowed. Contractor shall remediate any and all evidence of mold, mildew, or rust per applicable state standards and requirements.

3.2 FIELD OFFICE

A. Furnish a job trailer installed at a suitable location on site for use by the Contractor and the Architect.

B. Provide and maintain a weather tight building with operable and lockable door and windows, to serve as a job office available to the Contractor, subcontractors, and the Owner and Architect. Provide lights, electricity, air conditioning and heat, as required. Remove office from premises when one can be set up inside the building. Provide job telephone and other miscellaneous items as outlined below.
   1. Provide a separate locked room to serve as an office for the Owner and Architect, of an area of 100 SF, or provide in a separate building in close proximity to Contractor's office.
   2. Contractor's office shall be of a size, and furnished, so that it may be used for small progress meetings.
   3. Provide adequate artificial lighting, heating and cooling to provide comfortable conditions for occupants.
   4. Provide direct line telephone service, for both voice communication and facsimile machines at Contractor's office and Owner/Architect's office.
   5. Provide high speed internet access; DSL or broadband. Dial-up connection is not acceptable.
   6. Maintain a complete set of Construction Documents, Submittals, Record Documents, and other pertinent information for Contractor, Architect, Engineer, and Owner use.
   7. Furnishings Required:
      a. For Contractor's office: Racks and files for Contract Documents and for Record Documents; conference table and chairs; and desks and chairs as required by Contractor.
      b. For Owner/Architect's office: One four (4) drawer metal file cabinet, one lay-out drafting table 36 inch by 72 inch by 36 inch high; and drafting stool. Provide one drawing rack for 30 inch by 42 inch drawings. The Contractor will pay the monthly phone charges for all calls and base service charges for phone lines and fax lines that are brought into the Owner/Architect office. Provide the Owner and Architect with a key to the Owner/Architect office only.

3.3 MOBILE TELEPHONE

A. Furnish and maintain a mobile telephone for his superintendent's use for the duration of the Project.

3.4 SANITARY FACILITIES

A. Furnish and maintain temporary sanitary facilities. Comply with regulations of State Department of Health and other authorities having jurisdiction. The Contractor may not use the Owner's facilities.

3.5 STORAGE FACILITIES

A. Provide and maintain adequate weathertight lockable storage facilities, raised above the ground, with sides and top enclosed.

B. Replace materials improperly stored and damaged by weathered conditions.

C. Remove storage facilities when materials can be stored within the structure in a weathertight condition.

D. Provide for temporary freeze protection as needed.

3.6 SIGNS

A. Furnish and install a project sign 6'-0" by 8'-0" in size. Image will be provided to the graphics printing company by the Architect after Award of Contract. Contractor will be responsible for the cost of printing the image, mounting the sign on an aluminum substrate and installing the sign at the site. The sign will include the name of the project, District, name and title of Board of Trustees, District Superintendent, Contractor, Architect, and each of the project consultants. A total of (3) Three will be required on the project – one at each job site.

B. Other signs permitted at the site:
1. Warning signs.
2. Directional signs.
3. Identification signs at field offices.
4. Emergency medical services sign.
5. Signs required by Authorities Having Jurisdiction
6. Storm Water Pollution Prevention Plan sign (SWPPP)

C. Contractor shall allow no other signs to be displayed at the project site, unless authorized by the Owner.

3.7 BARRIERS

A. Provide temporary barricades on all portions of the site adjacent to the construction and accessible to the public.

B. Provide approved barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, water puddling and continuous running water.

3.8 SECURITY

A. Determine if and when watchmen are necessary for protection of the Work, and provide such services when necessary. Neither the provision of watchmen nor the failure to provide watchmen shall relieve the Contractor of responsibility in event of injury to persons or damage to property.

3.9 CONSTRUCTION FENCE

A. Provide a minimum 6 feet 0-inch-high chain link construction fence around the perimeter of the construction area for the duration of the construction period. Said temporary construction fence shall have lockable access gates necessary to adequately access the site in order to execute the project. Access gates shall be locked at the completion of each day's work.

3.10 CLEANING

A. Trash removal: Clear the building and site of trash at least once a week. When rapid accumulation occurs, make more frequent removals. Remove highly combustible trash such as paper and cardboard daily. Dumpsters will not be allowed to overflow and should be emptied on a regular basis.

B. Disposition of Debris: Remove debris from site and make legal disposition. Locations for disposal shall be of the Contractor's choice within the above restriction. Neither debris nor material may be buried or burned at the site. Take necessary precautions to prevent accidental burning of materials by avoiding large accumulations of combustible materials.

C. Final Cleaning: Thoroughly clean the Work, including the removal of smudges, marks, stains, fingerprints, soil, dirt, paint spots, dust, lint, discolorations, and other foreign materials.

3.11 TEMPORARY FIRST AID FACILITIES

A. Provide first aid equipment and supplies, with qualified personnel continuously available to render first aid at the site.

B. Provide a sign, posted at the field office telephone, listing the telephone numbers for emergency medical services: Physicians, ambulance services and hospitals.

3.12 TEMPORARY FIRE PROTECTION

A. Provide a fire protection and prevention program for employees and personnel at the site; and provide and maintain fire extinguishing equipment ready for instant use at all areas of the Project and at specific areas of critical fire hazard.

B. Equipment:
   1. Hand extinguishers of the types and sizes recommended by the National Board of Fire Underwriters to control fires from particular hazards.
   2. Barrels of water with buckets designated for fire-control purposes.
   3. Water hoses connected to an adequate water pressure and supply system.
   4. Construction period use of permanent fire protection system.

C. Enforce fire-safety discipline:
   1. Store volatile materials in an isolated, protected location.
   2. Avoid accumulations of flammable debris and waste in or about the Project.
   3. Prohibit smoking in the vicinity of hazardous conditions.
   4. Closely supervise and provide fire watches as required by authorities having jurisdiction during and after welding and torch-cutting operations in the vicinity of combustible materials and volatile conditions.

5. Supervise locations and operations of portable heating units and fuel.

D. Contractor shall maintain fire-extinguishing equipment in working condition, with current inspection certificate attached to each extinguisher.

3.13 CONSTRUCTION AIDS

A. Provide construction aids and equipment required to assure safety for personnel and to facilitate the execution of the Work; Scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other equipment.

B. Maintain all equipment in a first-class, safe condition.

3.14 PARKING FACILITIES

A. Coordinate location of parking for personnel and employees at the facility to avoid interference with traffic, walks, work and storage areas, or with materials-handling equipment.

B. Grade and provide drainage facilities to assure runoff of rainwater and to avoid blockage of flow from adjacent areas.

3.15 STORM WATER CONTROL & POLLUTION PREVENTION PLAN

A. Grade and provide drainage facilities to assure runoff of rainwater and to avoid blockage of flow from adjacent areas. Refer to Civil Drawings for additional requirements.

B. Provide and maintain a Storm Water Pollution Prevention Plan in accordance with Federal EPA requirements.

C. File an EPA "Notice of Intent" Form with the EPA **before construction begins.**

END OF SECTION

DOCUMENT 015200 - GEOTECHNICAL DATA.

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. A geotechnical investigation report for Project, prepared by Millennium Engineers Group, Inc., MEG Report No. – 01-19-29117 dated March 8, 2019, is attached hereto for reference.

END OF DOCUMENT 015200

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SECTION 015600 - CONSTRUCTION TRAFFIC CONTROL

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK

A. This item shall consist of the construction, manipulation, maintenance and removal, if required, of detours of the length and to the lines, grades and typical sections indicated and providing for installing, moving, replacing, maintaining, cleaning and removing upon completion of the work, as required, all detour markers, signs, barricades and other devices used in traffic control and handling at the construction site as indicated or as directed by the Engineer.

B. This item shall also consist of providing installing, moving, replacing, maintaining, cleaning and removing temporary or permanent street closure barricades, signs or other devices required to handle the traffic in conformance with the current edition of the Texas Manual of Uniform traffic Control Devices of Street and Highways and as indicated or directed by the Engineer.

1.2 SUBMITTAL

A. Conform to requirements of Section 013300, SUBMITTALS.

B. Submit proposed traffic routing plan, in accordance with the Texas Manual on Uniform Traffic Control Devices (TxMUTCD), latest edition.

PART 2 - PRODUCTS

2.1 CONSTRUCTION TRAFFIC CONTROL SIGNS

A Construction traffic control signs shall constructed by plywood.

1. Construction traffic control signs used herein shall be fabricated using sheeting conforming to the requirements of the manufacturer.
    1. The substrate for construction signs need only be sufficiently durable to last the life of the project and sufficiently rigid to hold the sheeting in a flat plan.

2.2 SIGN SUPPORTS

A. Supports for construction traffic control signs shall be grade #2 fir or yellow pine, pressure treated with pentachlorophenol.

B. Supports shall have a minimum nominal size of 4-inches x 4-inches and conform tot he details shown on the plans.

2.3 PORTABLE SIGN SUPPORT

A. Materials for portable sign supports shall comply with the details shown on the plans. Portable sign supports other than those shown on the plans shall be submitted to the Project Manager for approval

prior to use.

2.4 BARRICADES

A Barricades shall be classified as Type I, Type II or Type III and shall comply with the details shown on the plans and the TMUTCD.

1. Barricade rails shall be fabricated using S4S Grade #2 fir or yellow pine and reflectorized sheeting conforming to the requirements.

2.5 VERTICAL PANELS

A. Materials for vertical panels shall conform to the details shown on the plans. Vertical panels shall be reflectorized with orange and white reflective sheeting or tape in accordance with the requirements.

2.6 ABBREVIATED PAVEMENT MARKINGS FOR CONSTRUCTION

A. The pavement-marking material shall consist of an adhesive-back reflective tape which can get applied to the pavement. Markings shall be of goof appearance, have straight, unbroken edges and have a color that complies with all federal regulations.

1. Color
   (a) The markings, as well as retroreflected light from the markings, shall be white or yellow as indicated.
2. Visibility
   (a) The pavement markings (during daylight hours) shall be distinctively visible of ra minimum of 300 feet unless sigh distance is restricted by geometric roadway features.
   (b) The pavement markings (when illuminated by automobile low beam headlights at night) shall be distinctively visible for a minimum of 160 feet unless sight distance is restricted by geometric features.
   (c) The above day and night visibility requirements shall be met when viewed from an automobile traveling on the roadway.

2.7 CHANNELIZATION DEVICES

A. Barrels

1. Barrels shall be of metal or nonmetal composition approved by the Engineer and of 30 to 55 gallon capacity. Only one size may be used on the project. The barrels shall be reflectorized with orange an white reflective sheeting or tape in accordance with the requirements of TMUTCD. The markings on the barrels shall be horizontal, circumferential, orange wide. There shall be a minimum of 55 alternating orange and white stripes on each barrel. Barrels shall also conform to the details shown on the plans.
2. Type "B" barrels shall be equipped with either Type "A" low intensity or Type "C" steady-burn warning lights complying with the provisions to TMUTCD and the ITE standard for flashing and steady-burn lights. The use warning light shall be as directed by the Engineer.

B. Traffic Cones

1. Traffic cones shall conform to the details shown on the plans.

C. Tubular Traffic Markers

1. Post
   (a) The post shall be of a thermoplastic or pliable elastomer composition meeting the manufacturer's requirements.
   (b) Dimensions:

Outside Diameter	2.23 inches to 4 inches
Wall Thickness	0.125 inch minimum
Length	18 to 36 inches
Color	Orange

2. Base
   (a) The base shall be of thermoplastic or pliable elastomer composition meeting the manufacturer's requirements.
   (b) Dimensions:

Height	1.2 to 2 inches
Outside Diameter	7 to 12 inches
Color	black or same color as post

3. Assembly Units
   (a) Assembly units which are inherent with the particular marker shall be as per manufacturer's recommendations.
4. Adhesives
   (a) Adhesive shall be epoxy type (permanent installation or butyl type (temporary installation) as per manufacturer's recommendations.
5. Reflectorization
   (a) If used at night, tubular traffic markers shall have two 3-inch, circumferential reflective bands, no more than 2-inches from the top with no more than 6-inches separating the bands. Reflective material shall be SIA-250 or higher sheeting conforming to the provisions of this Section. The color of reflective material shall be as shown in the plans.

2.8 SEQUENTIAL ARROW DISPLAYS

A. Sequential arrow displays shall be sequentially lighted and roof or trailer mounted. The minimum panel size shall be 30 inches high and 54-inches wide. The display shall have 22 hooded sealed beam amber lamps rated at a maximum intensity of 8800 candlepower.

B. Light intensity shall be adjustable by dimmer switch. The operating modes shall be as follows:

1. Pass Left. 3 chevrons of 5 lamps each sequence in right to left pattern 40 to 50 times per minute.
2. Pass Right. 3 chevrons of 5 lamps each sequence in left to right pattern 40 to 50 times per minute.
3. Pass Either Side. The two outermost chevrons on each end of the panel pointing like arrowheads and flashing 40 to 50 times per minute with crossing row of lamps burning

continuously.

4. Warning. 4 lamps, one at each corner of the panel, flashing 40 to 50 times per minute.

PART 3 - EXECUTION

3.1 CONSTRUCTION TRAFFIC CONTROL SIGNS AND SIGN SUPPORTS

A. Construction traffic control signs and sign supports shall be installed at locations noted on the plans in conformance with the TMUTCD or as directed by the Engineer.

3.2 PORTABLE SIGN SUPPORTS

A. Portable sign supports for traffic control devices for detours shall be furnished by the Contractor, shall be installed at the locations shown on the plans, unless otherwise shown on the plans, and shall remain the property of the Contractor.

B. Unless otherwise specified, portable sign supports shall be of the dimensions shown on the plans.

3.3 BARRICADES

A. Barricades shall be installed in conformity with the details noted on the plans or as directed by the Engineer.

3.4 VERTICAL PANELS

A. Vertical panels shall be installed in conformity with the details noted on the plans or as directed by the Engineer.

3.5 CONSTRUCTION TRAFFIC MARKINGS

3.6 ABBREVIATED PAVEMENT MARKINGS FOR CONSTRUCTION

A. Abbreviated markings meeting all specification requirements shall be in place on all roadways on which traffic is allowed and where suitable standard pavement marking is not in place. The transverse location of the line(s) formed by the markings shall be as determined by the Engineer.

B. Unless otherwise indicated, the abbreviated markings shall be placed as follows:

Condition	Spacing	Length of Stripe
Straight	40 feet approximately	48-inch
Curve greater than 2 degrees	20 feet maximum	48-inch
Curve less than or equal 2 degrees	40 feet maximum	48-inch

i. Pavement markings shall be a minimum of 3 7/8 inches wide. Length and spacings will be in accordance with these specifications.

ii. The spacing of stripes may be modified by the Engineer. However the maximum spacing specified above shall not be exceeded in any case.

iii. The Contractor will be responsible for maintaining the abbreviated pavement markings until standard pavement markings are in place.

iv. Abbreviated pavement markings shall be removed after all permanent markings have been in place.

3.7 CHANNELIZATION DEVICES

A. Type "A" Barrels

1. Type "A" barrels shall be used during daylight hours only and shall not be equipped with warning lights of any type.

B. Type "B" Barrels

1. Type "B" barrels shall be equipped with warning lights. Type "B" barrels shall be used during nighttime hours only, unless otherwise shown on the plans or directed by the Project Manager.
2. The term "daylight hours" refers to those hours between dawn and dusk. The term "nighttime hours" refers to those hours between dusk and dawn.

C. Traffic Cones

1. Traffic cones shall be installed in conformity with the plans and the TMUTCD or as directed by the Engineer.

D. Tubular Traffic Markers

1. The metal, concrete or bituminous surface where the tubular traffic markers are to be placed shall be thoroughly cleaned.
2. Metal and concrete surfaces shall be sandblasted or wire brushed. Bituminous surfaces shall be cleaned in accordance with manufacturer's recommendations.
3. All loose sand, dust and other deleterious debris from cleaned mounting surfaces shall be removed.
4. Tubular traffic markers shall be installed in conformity with details and at locations shown on the plans or as directed by the Engineer and in accordance with the manufacturer's recommendation.
5. In the event that removal of an installation (temporary or permanent) is effected and the metal, concrete, or bituminous surface is damaged the Contractor shall repair and otherwise restore said surface to its original condition at no additional cost to the Owner.
6. All defective post(s), base(s), assembly unit(s), adhesive(s) or reflective sheeting contributing to the detriment of the intended function of the tubular traffic markers shall be replaced by the Contractor at no addition cost to the Owner.
7. Channelization devices shall be and installed in accordance with the details shown on the plans, except that barrels shall be as noted herein.

3.8 SEQUENTIAL ARROW DISPLAY

A. Sequential arrow displays shall be used according to the requirements shown on the plans and shown in TMUTCD.

3.9 CONSTRUCTION DETOURS

A. The detours shall be constructed at the locations and to the lines and grades indicated and it shall be the entire responsibility of the Contractor to provide for the passage of traffic in comfort and safety without creating a dust problem.

3.10 CONSTRUCTION METHODS

A. Prior to commencing construction, suitable "Construction Traffic Control" devices shall be installed to protect the workers and the public.

B. The Contractor shall be responsible for installing all markers, signs and barricades conforming to the Texas Manual on Uniform Traffic Control Devices and/or as indicated. If, in the opinion of the Engineer, additional markers, signs or barricades are needed in the interest of safety, the Contractor will install such as are required or as directed by the Engineer.

END OF SECTION 015600

SECTION 01 71 23

FIELD ENGINEERING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Measures to ensure adequate quality control and quality assurance for all Work in accordance with Conditions of the Contract, as specified herein, and with the quality control and quality assurance requirements of each Specification Section, and authorities having jurisdiction.

1.2 RELATED SECTIONS

A. All Sections of Work requiring layout, survey, reference points and their verification and protection, and quality control and assurance monitoring requirements.

1.3 DEFINITIONS

A. Survey and Field Engineering: Wherever the terms “Survey”, “Field Engineering” or any derivative thereof, or similar term appears within this Section, they mean one and the same, and shall mean the survey or field engineering work performed by the Field Engineer as defined below and is separate from that of the survey work provided by the Owner.

B. Field Engineer: Wherever the term “Field Engineer” or any derivative thereof, or similar term appears in the Contract Documents, it shall refer to the General Contractor’s employee(s) that are expert in, routinely engaged in, and have at least five (5) years experience in, the practice of construction project field engineering, building and project layout, construction measurements and monitoring, etc.

C. “Construction Surveyor”: Wherever the term “Construction Surveyor”, or any derivative thereof, or similar term appears in the Contract Documents, the entity (person or firm) licensed as a Registered Professional Land Surveyor or Professional Engineer of the discipline required for specific service on the Project in the State in which the Project occurs, with five (5) years minimum experience, and meeting all applicable regulations of the State in which the Project occurs and Department of Labor, and other authorities having jurisdiction to perform the Work. To avoid any misunderstanding or lack of interpretation, the entity responsible for performing the Work of this Section shall be employed by the General Contractor, and the responsibility, including methods and means, is totally that of the General Contractor.

D. Quality Control and Quality Assurance: Wherever the terms “Quality Control”, “Quality Assurance” or any derivative thereof, or similar term appears in the Contract Documents, they mean one and the same, and shall mean an aggregate of activities of the General Contractor, such as design analysis and statistical sampling with inspection for defects, designed to ensure adequate quality in materials and workmanship whether factory manufactured or jobsite produced.

1.4 QUALITY CONTROL AND QUALITY ASSURANCE

A. Employ a Construction Surveyor complying with the definition above and acceptable to the Owner and Architect, to perform all Construction Surveying. Provide full responsibility for the Construction Surveyor and accuracy of the performance of all items of Work shown on Drawings, specified herein, or in other Specification Sections.

1.5 SUBMITTALS FOR REVIEW

A. Submit name, address, telephone number, fax number, and registration number of the proposed Construction Surveyor prior to starting Work of this Section.

B. Submit evidence of Construction Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate, if different from Construction Manager's.

C. Upon request by Architect, submit documentation verifying accuracy of all Survey Work, including a certificate sealed and signed by the Construction Surveyor, that the elevations and locations of the Work are in conformance with Contract Documents and such information has been incorporated into the Project Record Documents.

D. Submit Project Record Documents under provisions of Section 01 77 00, Closeout Procedures.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of discrepancies discovered.

3.2 SURVEY REFERENCE POINTS

A. Locate and protect survey control and reference points.

B. Control datum for survey is that established by the Owner provided survey and as indicated on Drawings.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original Owner's survey control. Make no changes without prior written permission of Architect.

3.3 FIELD ENGINEERING AND CONSTRUCTION SURVEYOR REQUIREMENTS

A. Establish a minimum of two (2) permanent benchmarks on site, referenced to established control points. Record locations, with horizontal and vertical data, on Project Record Documents.

B. Field Engineer shall establish elevations, lines and levels. Locate, lay out, and monitor by instrumentation and similar appropriate means Work, including, but not be limited to:
1. elevations, and layout of property lines and easements;
2. site drainage, including storm water control and pollution prevention measures, slopes, swales, and invert elevations;
3. limits of clearing and grubbing, including identification of trees and planting to be removed and methods for protection of those to remain;
4. excavations, fill and topsoil placement, and all (rough and finish) grades;
5. trenching and trench safety;
6. utility locations;
7. concrete and asphaltic concrete paving, curbs, ramps, and other site improvements, as applicable;
8. grid or axis for structures, batter board locations;
9. elevation, grade controls, and layout of building foundation and grade beams, column locations, base plates, embedded items, depressions, formwork, and openings in concrete, including all interior finish grades;
10. elevations of structural steel, including, steel joists/trusses, steel decks, and associated miscellaneous metals;
11. elevations and layout of masonry, including concrete masonry units (CMU), face brick, cast stone, and other elements built-in masonry.
12. elevations and slopes of roofing, including those for lightweight insulating concrete deck system, if applicable.
13. elevations and layout of work as required to ensure proper operation, clearances, and tolerances, including conveying systems, plumbing and mechanical work; and
14. monitoring of movement and protection of existing or adjacent structures, as applicable.

C. Throughout course of Work, verify existing conditions and layouts by same means as originally used to ensure conformance with design requirements and details. Notify Architect immediately, if discrepancies are found.

D. Provide one (1) copy each of reduced Field Engineer's notes to the Architect, Owner, Construction Surveyor, and affected Consultant within four (4) working days of completion of each portion of the Field Engineering Work.

E. Field Engineer's notes shall be clear and complete. The Field Engineer shall be available at no expense to the Owner, Architect, or Consultants for note interpretation, if required.

F. Field Engineer shall perform surveys to determine quantities of unit cost work, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

G. Provide Construction Surveying services. Utilize recognized engineering survey practices.

H. Construction Surveyor shall verify and record/document their findings, on a drawn survey at a scale matching that of the original Contract Documents, for the following:

1. All property lines and corners
2. All building corners
3. All paving corners
4. Finish floor of all/each buildings
5. Invert elevations, flow lines for all site drainage structures and improvements

I. Payment for earthwork quantities shall be for materials in place, compacted, and determined by neat line method.

J. Provide the Owner a reproducible hard copy and digital/electronic file copy of all the Construction Surveyor's work.

3.4 PROJECT RECORD DOCUMENTS

A. Maintain a complete and accurate log of control and Field Engineer work as it progresses.

B. Upon completion of Work, including, but not limited to earthwork, formwork, foundation, structural steel erection, and major site improvements, prepare Project Record Documents illustrating dimensions, locations, angles, and elevations of construction and site work.

C. Submit Project Record Documents as specified in Paragraph 1.5.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Definition: “Cutting and Patching” includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original undamaged condition, including original fire rating of fire rated construction.
   1. Cutting and patching is performed for coordination of the work for access or inspection, to obtain samples for testing, as indicated or required, to remove/replace defective work or work not conforming to the contract documents, to permit alterations to be performed, or for other similar purposes.
   2. Cutting and patching performed during the manufacture of products or during the initial fabrication, erection, or installation processes is not considered to be “cutting and patching” under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be “cutting and patching”.

B. Refer to other Sections of these Specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
   1. Unless otherwise specified, requirements of this Section also apply to mechanical and electrical work.

1.2 QUALITY ASSURANCE

A. Visual requirements - Do not cut and patch work exposed on the building’s exterior or in its occupied spaces, in a manner that would, in the Architect’s opinion, result in lessening the building’s aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patchwork. Remove and repair or replace work judged by the Architect to be cut and patched in a visually unsatisfactory manner

1.3 RELATED WORK

A. All Sections of Work requiring cutting and patching, including electrical requirements.

1.4 SUBMITTALS

A. Procedural Proposal for Cutting and Patching - Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal.
   1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operational, and visual changes as well as other significant elements.
   2. List products to be used and firms including their qualifications that will perform the work. Also, provide cost proposals when applicable.
   3. Give dates when work is expected to be performed.

4. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be disconnected or out-of service temporarily. Indicate how long utility service will be disrupted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General - Except as otherwise indicated or as directed by Architect, use materials for cutting and patching that are identical to materials being cut and patched. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal or better performance characteristics.

1. The use of trade name and supplier's name and address is to indicate a possible source of the material or product. Product of the same type from other sources shall not be excluded provided they possess like physical and functional characteristics, except where specified as no substitutions allowed or where a material or product is specified as the basis of specification and no other approved manufacturers are listed.
2. Use materials, products, and devices to maintain integrity of fire rating of existing fire rated construction which comply with the requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before starting work, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

1. Before the start of cutting work, meet at the work site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict between the various trades. Coordinate layout of the work and resolve potential conflicts before proceeding with the work.
2. After uncovering work, examine conditions affecting installation of product or performance of work.
3. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with work until Architect has provided further instructions.

3.2 PREPARATION

A. Provide temporary support to prevent failure of the work to be cut.

B. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions of that part of the Project that may be exposed during cutting and patching operations.

C. Take precautions not to cut existing pipe, conduit, ducts, or wires serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General - Employ only skilled workmen to perform the cutting and patching work. Except as otherwise indicated or as approved by Architect, proceed with cutting and patching at the earliest feasible time and complete the work without delay.

B. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible, review proposed cutting and patching procedures with the original installer and comply with original installer's recommendations.
   1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
   2. Comply with requirements of other applicable sections where cutting and patching requires excavating and backfilling.
   3. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated, or abandoned. Cut-off conduit and pipe in walls or partitions to be removed. After by-passing and cutting, cap, valve, or plug and seal tight remaining portion of conduit and pipe to prevent entrance of moisture, vermin, or other foreign matter.

C. Patching - Patch with seams which are durable and as invisible as possible. Comply with specified tolerance, if any, for the work.
   1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
   2. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.
   3. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor, wall, and ceiling surfaces in the new space to provide an even surface of uniform color and appearance. If necessary, to achieve uniform color and appearance, remove existing floor and wall coverings or materials, and ceiling finish materials and replace with new materials.
      a. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coats.
   4. Patch, repair, or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.
   5. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through non-fire-rated floors and walls, and through finished surfaces.

D. Fire Rated Construction - Where cutting and patching is necessary in existing fire rated construction, use sealant and other fire resistive materials, products, and devices as required and acceptable by the authorities having jurisdiction to repair, patch, and otherwise restore original fire rating and integrity of construction.

3.4 CLEANING

A. Thoroughly clean area and spaces where work is performed or used as access to work. Remove completely: paint, mortar, cement, oils, putty, sealant, and items of similar nature. Thoroughly clean piping, conduit, and similar features before painting or other finishes are applied. Restore damaged pipe covering to its original undamaged condition.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition and construction waste.
   2. Recycling nonhazardous demolition and construction waste.
   3. Disposing of nonhazardous demolition and construction waste.

B. Related Sections include the following:
   1. Division 01 Section “Temporary Facilities and Controls” for environmental-protection measures during construction.
   2. Division 02 Section “Structure Demolition” for disposition of waste resulting from demolition of buildings, structures, and site improvements.
   3. Division 02 Section “Selective Structure Demolition” for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
   4. Division 04 Section “Unit Masonry” for disposal requirements for masonry waste.
   5. Division 04 Section “Stone Masonry” for disposal requirements for excess stone and stone waste.
   6. Division 31 Section “Site Clearing” for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
   1. Demolition Waste:

a. Asphaltic concrete paving.
b. Concrete.
c. Concrete reinforcing steel.
d. Brick.
e. Concrete masonry units.
f. Wood studs.
g. Wood joists.
h. Plywood and oriented strand board.
i. Wood paneling.
j. Wood trim.
k. Structural and miscellaneous steel.
l. Rough hardware.
m. Roofing.
n. Insulation.
o. Doors and frames.
p. Door hardware.
q. Windows.
r. Glazing.
s. Metal studs.
t. Gypsum board.
u. Acoustical tile and panels.
v. Carpet.
w. Carpet pad.
x. Demountable partitions.
y. Equipment.
z. Cabinets.
aa. Plumbing fixtures.
bb. Piping.
cc. Supports and hangers.
dd. Valves.
ee. Sprinklers.
ff. Mechanical equipment.
gg. Refrigerants.
hh. Electrical conduit.
ii. Copper wiring.
jj. Lighting fixtures.
kk. Lamps.
ll. Ballasts.
mm. Electrical devices.
nn. Switchgear and panelboards.
oo. Transformers.

2. Construction Waste:
a. Site-clearing waste.
b. Masonry and CMU.
c. Lumber.
d. Wood sheet materials.
e. Wood trim.
f. Metals.
g. Roofing.
h. Insulation.
i. Carpet and pad.
j. Gypsum board.
k. Piping.
l. Electrical conduit.

3. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
   a. Paper.
   b. Cardboard.
   c. Boxes.
   d. Plastic sheet and film.
   e. Polystyrene packaging.
   f. Wood crates.
   g. Plastic pails.

1.4 SUBMITTALS

A. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

B. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

D. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

E. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 01 Section “Temporary Facilities and Controls” for operation, termination, and removal requirements.

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section “Temporary Facilities and Controls” for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.

5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals. Break up concrete and transport paving to recycling facility.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.
1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

K. Plumbing Fixtures: Separate by type and size.

L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

M. Lighting Fixtures: Separate lamps by type and protect from breakage.

N. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

O. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:
   1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
   2. Polystyrene Packaging: Separate and bag materials.
   3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
   4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.

C. Wood Materials:
   1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
   2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
   1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 PRE-CLOSEOUT MEETING

A. Pre-Closeout Meeting: Schedule and convene Pre-Closeout Meeting with Owner and Architect in accordance with Section 01 31 19, Project Meetings.

1.2 SUBSTANTIAL COMPLETION

A. The items listed in Document CB, Supplementary Conditions, Paragraph 9.8 and the following items shall be completed before Substantial Completion will be granted:
   1. Contractor's Completion List (Punch List): Submit a thorough list of items to be completed or corrected, along with a written request for Substantial Completion and for review of the Work or portion of the Work. The Architect/Engineer's Project Representative, at their discretion, may attend and assist in the preparation of the Contractor's Punch List.
   2. Architect's Supplemental Punch List: The Architect/Engineer, along with the Owner at the Owner's discretion, will inspect the Work utilizing the Contractor's prepared Punch List, noting completed items and incomplete items, and will prepare a supplemental list of items that have been omitted or incomplete items that were not previously noted.
   3. Operations and Maintenance Manuals: Submit as described in paragraph 1.3.
   4. Final Cleaning: Provide final cleaning and adequate protection of installed construction as described in paragraph 1.6 and 1.7.
   5. Starting of systems: Start up equipment and systems as described in paragraph 1.8.
   6. Testing and balancing: Testing and balancing of systems must be performed and completed by Owner's forces, and the report submitted and accepted by Architect/Engineer and Owner, as described in the Contract Documents. Make adjustments to equipment as required to achieve acceptance.
   7. Demonstrations: If required by individual specification sections or by Owner, provide demonstrations and instructions for use of equipment as described in paragraph 1.9.

B. Date of Substantial Completion: Complete or correct items identified on Punch List and confirm that all items have been corrected prior to Architects re-inspection. Architect/Engineer, along with the Owner, will re-inspect the corrected work to establish the Date of Substantial Completion. Incomplete items remaining will be appended to the Certificate of Substantial Completion (AIA G704). The Date of Substantial Completion represents day one (1) of the closeout period, and represents the date of commencement of the Contractors correctional period and all warranty periods as described and required by the Contract Documents, except as amended in the Certificate of Substantial Completion and elsewhere in the Contract Documents.

C. Certificate of Substantial Completion: When the Work or designated portion thereof is substantially complete, Architect will prepare the Certificate of Substantial Completion to be executed by the Owner and Contractor. Items on the appended Punch List shall be completed or corrected within the time limits established in the Certificate.

1.3 OPERATIONS AND MAINTENANCE MANUAL

A. As a requirement for Substantial Completion, the final Operation and Maintenance Manual shall be submitted to and reviewed and accepted by the Architect prior to issuance of the Certificate.

B. Prepare 3-ring D-slant binder cover and spline with printed title "OPERATIONS AND MAINTENANCE MANUAL", title of project, and subject matter of binder when multiple binders are required.

C. Submit one (1) copy of preliminary Operations and Maintenance Manuals to respective consultants (Civil, MEP, Structural, *etc*.) for review of conformance with contract requirements prior to submitting final to Architect. Allow time for proper review.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and Maintenance, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Equipment start-up instructions
      e. Operating instructions.
      f. Maintenance instructions for equipment and systems.
      g. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Product data.
      b. Air and water balance reports.
      c. Photocopies of warranties, certificates and bonds. Submit originals with Closeout Documents as specified below.

G. Submit one (1) final original and two (2) copies to Architect.

H. Submit one (1) final in .pdf format to the Owner in a USB / Thumb drive.

1.4 PROJECT CLOSEOUT

A. Final Payment will not be authorized by the Architect until the Architect finds the Work acceptable under the Contract Documents, subject to the completion and acceptance of the following requirements and other applicable Contract requirements:

1. Close-out Documents: Provide bound closeout documents as described in paragraph 1.5. Refer to Document CB, Supplementary Conditions, Paragraph 9.10 for additional information.
2. Record Documents: Submit as described in paragraph 1.10.
3. Extra materials: Provide extra stock, materials, and products as described in paragraph 1.11 when required by individual specification sections.
4. Locks: Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
5. Temporary Facilities: Discontinue and remove temporary facilities from the site, along with mockups, construction aids, and similar elements.
6. Warranties, Certificates and Bonds: Execute and assemble transferable warranty documents, certificates, and bonds from subcontractors, suppliers, and manufacturers as described in paragraph 1.12.
7. Final Inspection and Acceptance by Architect is achieved as described in paragraph 1.13.

1.5 CLOSEOUT DOCUMENTS

A. Coordinate the following items with the requirements of Document CB, Supplementary Conditions of the Contract.

B. Prepare 3-ring D-slant binder cover and spline with printed title "CLOSEOUT DOCUMENTS", title of project, and subject matter of binder when multiple binders are required. Submit one (1) original and two (2) copies.

C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. The close-out documents shall be neatly organized and easily useable as determined by the Architect and Owner. Separate Close-out Documents binders from Operations and Maintenance Manuals. Documents identified as "affidavit" shall be notarized.

E. Contents: Prepare Table of Contents for each volume, with each item description identified, typed on white paper, in five (5) parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers. All General Contractor's vendors/suppliers and subcontractors that provided materials or performed any work related to this project must be listed on this form. Submit Final List of Subcontractors on Document AD.
   2. Part 2: Closeout Documents and Affidavits, include the following:
      a. AIA G707 - Consent of Surety to Final Payment;
      b. AIA G706 - Contractor's Affidavit of Payment of Debts and Claims;
      c. AIA G706A - Contractor's Affidavit of Release of Liens;
      d. Subcontractor's Release of Lien: Include contractor's, subcontractor's and direct material and equipment supplier's separate final releases. Submit on attached **Close-out Form "A"** - Affidavit of Subcontractor's Release of Lien.
   3. Part 3: Project documents and certificates, including the following:
      a. Copy of Certificate of Substantial Completion (AIA G704);
      b. Copy of All Permits;
      c. Copy of Final Utility Bill or letter of transfer;
      d. Copy of Certificate of Occupancy;
      e.

f. Hazardous Material Certificate: Submit on attached **Close-out Form "C"**. Affidavits from Contractor, Subcontractors and General Contractor's vendors or suppliers stating that no hazardous materials/products have been used or installed in this project.

4. Part 4: Warranties, compile sequentially based on specification sections:
   a. General Contractor's Warranty: Submit on company letterhead as described below. This Warranty shall state all sections of Work performed by General Contractor's own forces, and warranty period for each section of Work;
   b. Subcontractor's Warranty: notarized and submitted on attached **Close-out Form "D"**. This Warranty shall state all sections of Work performed by the subcontractor and warranty period;
5. Part 5: Receipts:
   a. Extra Stock: Provide original receipts for delivery of "Extra Stock" items as described below, (if applicable). Receipts must be signed by an authorized Owner's representative;
   b. Keys: Provide original receipts for delivery of "Keys", (if applicable). Receipts must be signed by an authorized Owner's representative.

F. In addition to the three (3) required close-out binders listed above, provide Architect with one (1) separate binder for their records containing the following:
   1. Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers;
   2. all MSDS sheets for the project;
   3. all warranties from Contractor, subcontractors, direct suppliers, and manufacturers.

G. Failure to complete and close-out project after substantial completion may result in liquidated damages being assessed to the Contractor. Refer to Conditions of the Contract for additional requirements and liquidated damages.

1.6 FINAL CLEANING

A. Execute final cleaning prior to final project inspection and acceptance.

B. Clean interior and exterior glass, and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces, mop hard floor surfaces.

C. Remove smudges, marks, stains, fingerprints, soil, dirt, spots, dust, lint, and other foreign materials from finished and exposed surfaces

D. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

E. Clean and replace filters of operating equipment as required by Contract Documents

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste and surplus materials, rubbish, and temporary construction facilities from site.

1.7 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections until Work is accepted by Architect and Owner.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.8 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect/Engineer and Owner 48 hours prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of Contractors' personnel, and installer in accordance with manufacturers' instructions.

G. When specified in individual specification sections or required by manufacturer, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. When specified in individual specification sections or required by Owner or Architect/Engineer, submit a written report in accordance with Section 01300, Submittal Procedures, that equipment or system has been properly installed and is functioning correctly.

1.9 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel a minimum of 48 hours prior to date of Final Completion in accordance with Owner’s requirements.

B. Demonstrate Project equipment instructed by qualified manufacturer's representative who is knowledgeable about the Project and equipment.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six (6) months.

D. Utilize maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment.

F. Prepare and insert additional data in maintenance manuals when need for additional data becomes apparent during instruction.

G. Review and verify proper star-up and operation of equipment prior to scheduling demonstrations with Owner.

1.10 PROJECT RECORD DOCUMENTS

A. Record Documents, as described in Section 01 78 39, shall be submitted at Project Closeout. Final Payment will not be authorized by the Architect until final review and acceptance by Architect and Engineers is achieved in accordance with the Owners requirements.

B. At the Contractors request, and with associated fee, Architect may provide electronic versions of the construction drawing and specification files for Contractors use, subject to the terms and conditions of Architects standard electronic document transfer agreement.

C. Submit reproducible to respective consultants (Civil, Structural, MEP, *etc*.) for review. Consultant will mark-up corrections and return to Contractor for final revisions. Make final revisions prior to submitting to Architect.
   1. Format: One (1) set of Dayrex film positive reproducibles and two (2) sets bluelines of approved reproducibles.
   2. In addition, provide the Owner with one (1) set of Record Drawings on a non-rewritable CD in AutoCAD® latest release.
   3. Submit One (1) USB / Thumb drive in .pdf format of documents to the Owner.

1.11 EXTRA STOCK, MATERIALS AND MAINTENANCE PRODUCTS

A. Furnish extra stock, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed by Owner; obtain signed receipt from Owner’s authorized representative prior to final application for payment. Delivery of materials to or obtaining receipt from anyone other than Owner’s authorized representative may constitute breach of this requirement and may require delivery of additional materials at no cost to the Owner if original materials are misplaced.

C. Include signed receipts for delivery of extra stock and materials, including keys, with Closeout Documents.

1.12 WARRANTIES, CERTIFICATES AND BONDS

A. Definitions:

1. Standard Product Warranties: preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
2. Special Warranties: written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide coverage of specific defects, or both.

B. In accordance with the general warranty obligations under Paragraph 3.5 of the General Conditions as amended by the Supplementary Conditions, the General Contractor's warranty shall be for a period of one (1) year following the date of Substantial Completion, hereinafter called the one-year warranty period. The Contractors one-year general warranty shall include all labor, material and delivery costs required to correct defective material and installation. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

C. The Contractor's one-year warranty shall run concurrently with the one (1) year period for correction of Work required under Paragraph 12.2 of the General Conditions.

D. In addition to the Contractors one-year warranty, Special Warranties as described in individual specifications sections, shall extend the warranty period for the period specified without limitation in respect to other obligations which the Contractor has under the Contract Documents.

E. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve the suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

F. Warranty Requirements:
1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
2. When Work covered by a warranty has failed and been corrected by replacement or reconstruction, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing defective Work regardless of whether the Owner ahs benefited from use of the Work through a portion of its anticipated useful service life.
4. Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
5. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or designated portion of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Compile copies of each required warranty properly executed by the Contractor and the subcontractor, supplier, or manufacturer. Verify documents are in proper form, contain full information, and are notarized. Co-execute warranties, certificates and bonds when

required and include signed warrantees with Closeout Documents submitted to the Architect.

1.13 FINAL COMPLETION AND FINAL PAYMENT

A. Final Notice and Inspection:
   1. When all items on the Punch List have been corrected, final cleaning has been completed, and installed work has been protected, submit written notice to the Architect that the Work is ready for final inspection and acceptance.
   2. Upon receipt of written notice that the Work is ready for final inspection and acceptance, the Architect and Engineer will make final inspection.

B. Final Change Order: When the Project Closeout items described above are successfully completed and the Work is found acceptable to Architect/Engineer and Owner, a Final Change Order will be executed. This Change Order will include any Allowance adjustments as required by the Contract Documents.

C. Final Application for Payment: When all of the above items are successfully complete, submit to the Architect a final Application for Payment and request for release of retainage.

D. Release of Retainage: Release of retainage will not be authorized by the Architect until Contractor completes all requirements for close-out to the satisfaction of the Owner and Architect as described herein.

1.14 TERMINAL INSPECTION

A. Immediately prior to expiration of the one (1) year period for correction of the Work, the Contractor shall make an inspection of the work in the company of the Architect and the Owner. The Architect and the Owner shall be given not less than ten (10) days notice prior to the anticipated date of terminal inspection.

B. Where any portion of the work has proven to be defective and requires replacement, repair or adjustment, the Contractor shall immediately provide materials and labor necessary to remedy such defective work and shall execute such work without delay until completed to the satisfaction of the Architect and the Owner, even if the date of completion of the corrective work may extend beyond the expiration date of the correction period.

C. The Contractor shall not be responsible for correction of work which has been damaged because of neglect or abuse by the Owner nor the replacement of parts necessitated by normal wear in use.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

CLOSE-OUT FORM "A"

SUBCONTRACTOR'S AFFIDAVIT OF RELEASE OF LIEN

STATE OF _____

COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, deposes and says:

1. That he / she is the _____ of _____, the subcontractor who supplied, installed, and /or erected the work described below, and that, he /she is duly authorized to make this Affidavit and Subcontractor Release:

   Project: **Hidalgo County Precinct 1 – Sunset Park Operations Facility**
   Owner: County of Hidalgo Architect: Alvarado Architects & Associates, Inc.
   Work Performed: _____Specification Section(s): _____

2. That all work required under the subject subcontractor of the subject construction project has been performed in accordance with the terms thereof, that all material men, sub-subcontractors, mechanics, and laborers have been paid and satisfied in full and that there are no outstanding claims of any character arising out of the performance of said subcontractor which have not been paid and satisfied in full.

3. That to the best of his / her knowledge and belief, there are no unsatisfied claims for damages resulting from injury or death to any employees, sub-subcontractors, or the public at large arising out of the performance of said subcontract, or any suits or claims for any other damages of any kind, nature, or description which might constitute a lien upon the property of the Owner.

4. That he / she has received full payment of all sums due him / her for materials furnished and services rendered by the undersigned in connection with the performance of said subcontract and has and does hereby release the Owner and the Architect and his consultants and the Contractor from any and all claims of any character arising out of or in any way connected with performance of said subcontract.

ATTEST (If Corporation)

_____
Name of Subcontractor

_____ _____
Secretary (By) (Title)

JURAT

STATE OF _____

COUNTY OF _____

Sworn to and subscribed before me on this _____ day of _____, 20_____.

_____
(Seal) (Notary Public Signature)

CLOSE-OUT FORM "C"

SUBCONTRACTOR HAZARDOUS MATERIAL CERTIFICATE

THE STATE OF _____

COUNTY OF _____

PROJECT: Hidalgo County Precinct 1 – Sunset Park Operations Facility

OWNER: County of Hidalgo

ARCHITECT: Alvarado Architects & Associates, Inc.

SPECIFICATION SECTION(S):

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, deposes and says that he / she is the _____ of _____, the subcontractor / supplier who constructed or provided the section(s) of work referenced above, and that he / she is duly authorized to certify to the best of his / her information, knowledge, and belief no asbestos, lead or PCB containing products have been incorporated into the project.

ATTEST (If Corporation)

_____
Name of Subcontractor / Supplier

_____ _____
Secretary (By)

_____
(Title)

JURAT

THE STATE OF _____

COUNTY OF _____

Sworn to and subscribed before me on this _____ day of _____, 20_____.

_____
(Seal) (Notary Public Signature)

CLOSE-OUT FORM "D"

SUBCONTRACTOR WARRANTY

STATE OF _____

COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, deposes and says:

1. That he / she is the Subcontractor (or the _____of_____ the subcontractor) who supplied, installed, and / or erected the work described below, and that, he / she is duly authorized to make this Subcontractor Warranty:

   Project: **Hidalgo County Precinct 1 – Sunset Park Operations Facility**
   Owner: County of Hidalgo Architect: Alvarado Architects & Associates, Inc.
   Work Performed: _____Specification Section(s): _____

2. The undersigned Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract are of good quality and new except where otherwise required or permitted by the Contract Documents, that the Work is free from defects not inherent in the quality required or permitted, and that the Work conforms with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Subcontractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Subcontractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.

3. In the event of failure of materials, products, or workmanship, during the specified warranty periods, the Subcontractor shall take appropriate measures to assure correction or replacement of the defective items, whether notified by the Contractor, Owner or Architect.

4. The Subcontractor warrants the work performed for a period of _____ months from the date of Substantial Completion, except as follows:_____
   _____

ATTEST (If Corporation)

_____
Name of Subcontractor

_____
Secretary (By) (Title)

JURAT

STATE OF _____

COUNTY OF _____

Sworn to and subscribed before me on this _____ day of _____, 20____.

_____
(Seal) (Notary Public Signature)

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Architects/Engineers written responses to Minor Change directives, Change Proposal Requests, and other supplemental instructions.
   5. Change Orders and other modifications to the Contract.
   6. Reviewed Shop Drawings, Product Data, and Samples.
   7. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner. Architect will review documents for general conformance but will not be responsible for completeness or accuracy of the recorded information.

C. Do not use record documents for construction purposes. Store record documents separate from documents used for construction. Protect record documents from deterioration and loss in a secure, weather-tight location in accordance with Section 01 50 00, Temporary Facilities.

D. Record information concurrent with construction progress, not less than weekly. Provide access to record documents for Architect’s reference during normal working hours.

E. Give particular attention to information on concealed products and installations that would be difficult to identify or measure and record later.

F. Mark record sets in red erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.
   1. Mark important additional information which was either shown schematically or omitted from original Documents.
   2. Note construction change directive numbers, alternate numbers, Change Order numbers and similar identification.
   3. Where feasible, the individual or entity who obtained record data, whether the individuals or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record documents.
      a. Accurately record information in an understandable drawing technique.
      b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.
   4. Sign or initial and date each mark-up.

G. Upon completion of the Work, submit Project Record Documents to Architect for the Owner's records in accordance with Section 01 77 00, Closeout Procedures.

1.2 RECORD SPECIFICATIONS

A. Record Specifications: Maintain one complete copy of the Project Manual including addenda and modifications issued. Legibly mark and record at each product section a description of actual products installed and variations in actual Work performed in comparison with products specified. Include the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by addenda and modifications.
   4. Related record drawing information and Product Data.
   5. Other information necessary to provide a record of selections made and to document coordination with record Product Data submittals and maintenance manuals.

1.3 RECORD DRAWINGS

A. Record Drawings: Maintain one complete blackline copy of the Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies from the Work as originally shown.
   1. Legibly mark each item to record actual construction including, but not limited to the following:
      a. Measured depths of foundations in relation to project finish floor datum.
      b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
      c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
      d. Field changes of dimension and detail.
      e. Details not on original Contract drawings.
      f. Revisions to details shown on the drawings.
      g. Dimensional changes to the drawings.
      h. Actual equipment locations.
      i. Duct size and routing.
      j. Changes made by Change Order; include change order number.

B. Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked to reflect changes in the Work, record a cross-reference at the corresponding location on the Contract Drawings.

C. Preparation of Transparencies: Prepare a full set of corrected reproducible Contract Drawings and Shop Drawings.
   1. Incorporate changes and additional information previously marked on print sets. Erase, redraw, and add details and notations where applicable. Identify and date each Drawing; include the printed designation "PROJECT RECORD DRAWINGS" in a prominent location on each Drawing.
   2. Remove Architects and Engineer's seal from drawings and specifications prior to issuance to Architect for approval.
   3. Refer instances of uncertainty to the Architect for resolution.

1.4 RECORD PRODUCT DATA

A. Maintain one copy of each Product data submittal for record document purposes. Mark Product Data to indicate the actual product installation. Include significant changes in the product delivered to the site, and changes in manufacture's instructions and recommendations for installation.

1.5 RECORD SAMPLE SUBMITTAL

A. Immediately prior to date of Substantial Completion, meet with the Architect, and Owner, at the Owner's discretion, at the site to determine which of the Samples maintained during the construction period shall be transmitted to Owner for record purposes. Comply with the Architect's instructions for packaging, identification marking, and delivery to Owner's Sample storage space. Dispose of other Samples in manner specified for disposal of surplus and waster materials.

1.6 MISCELLANEOUS RECORD DOCUMENTS

A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Categories of requirements resulting in miscellaneous records, include, but are not limited to the following:
   1. Ambient and substrate condition tests.
   2. Changes requested by Owner's consultants.
   3. Inspections and certifications by governing authorities.
   4. Inspection and testing by Owner's inspection agency.
   5. Fire resistance and flame spread test results.

1.7 CERTIFICATION

A. By submittal of Project Record Documents, Contractor certifies, that to the best of his knowledge, informational and belief the documents are a true and complete representation of the actual construction of the Work of this Project.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 02 32 00

GEOTECHNICAL REPORT

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 THE FOUNDATION INVESTIGATION REPORT

A. The geotechnical report entitled MEG Geotechnical Engineering Report Foundation and Pavement Recommendations – Proposed Sunset Operations Building, Mercedes, Hidalgo County, Texas, for the County of Hidalgo, Precinct 1, was prepared by Millennium Engineers Group, Inc., 5804 N. Gumwood Avenue, Pharr, Texas 78577, (956) 702-8500 based on soil borings taken at the project site on February 14, 2019. The project number for this report is MEG Report No. 01-19-29117 dated March 08, 2019.

B. The boring plan, results of laboratory tests, and description of stratum for each test hole are enclosed in this Section.

C. The Contractor is hereby advised to review the Geotechnical Report and visit the site to ascertain the conditions affecting the Work. In the event of discrepancies between the Drawings, Specifications, and Geotechnical Report, the Geotechnical Report shall take precedence. In the absence of a Geotechnical Report, discrepancies between Drawings and Specifications shall be brought to the attention of the Architect for resolution. Failure to review the Geotechnical Report and report discrepancies, between the Geotechnical Report, if any, and Drawings and Specifications, to the Architect will not relieve the Contractor from the responsibility to perform the work required by such documents, at no additional expense to the Owner.

1.2 SOIL CONDITIONS

A. The conditions indicated in the report were known to exist at the location shown on the date the tests were performed; however, these boring logs are for the Contractor's consideration only, and he shall visit the site and fully acquaint himself with the existing conditions and be prepared to complete all work required by the documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

MEG GEOTECHNICAL ENGINEERING REPORT

PROPOSED
SUNSET OPERATIONS BUILDING

MERCEDES, HIDALGO COUNTY, TEXAS



Geotechnical Engineering • Construction Materials Engineering & Testing
Environmental • Consulting • Forensics

GEOTECHNICAL ENGINEERING REPORT
FOUNDATION AND PAVEMENT RECOMMENDATIONS
PROPOSED SUNSET OPERATIONS BUILDING
MERCEDES, HIDALGO COUNTY, TEXAS

Prepared For
Mr. Jorge Peña
Hidalgo County Precinct 1

MEG Report No. 01-19-29117

March 8, 2019

MILLENNIUM ENGINEERS GROUP, INC.
TBPE FIRM NO. F-3913
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
TEL:956-702-8500
FAX:956-702-8140
WWW.MEGENGINEERS.COM

March 8, 2019

Mr. Jorge Peña
Hidalgo County Precinct 1
1902 Joe Stephens Avenue
Weslaco, TX 78596
jorge.pena1@co.hidalgo.tx.us

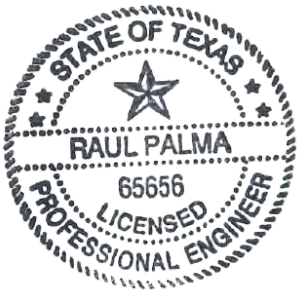
Subject: **Geotechnical Engineering Report**
MEG Report No. 01-19-29117
Foundation and Pavement Recommendations
Proposed Sunset Operations Building
Mercedes, Hidalgo County, Texas

Dear Mr. Peña:

Millennium Engineers Group, Inc. is pleased to submit the enclosed geotechnical engineering report that was prepared for the above subject project. This report addresses the procedures and findings of our geotechnical engineering study. Our recommendations should be incorporated into the design and construction documents for the proposed development.

We want to emphasize the importance that all our recommendations presented in this report and/or addendums to this report be followed. We look forward to continuing our involvement in the project by providing construction monitoring in accordance with the report recommendations and materials testing services during construction. We strongly recommend that we be a part of the preconstruction meeting to address any specific issues that are pertinent to this project.

Thank you for the opportunity to be of service to you in this phase of the project and we would like the opportunity to assist you in the upcoming phases of the project. If you have any questions, please contact our office at the address, telephone, fax or electronic address listed below.



Cordially,
Millennium Engineers Group, Inc.
TBPE Firm No. F-3913

Raul Palma, P.E.
President

The seal appearing on this document was authorized by Raul Palma, P.E. 65656 on March 8, 2019*. Alteration of a sealed document without proper notification to the responsible engineer is an offence under the Texas Engineering Practice Act*

Cc: 1 Original and PDF Document

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1.0 INTRODUCTION

Millennium Engineers Group, Inc. (MEG) has completed and is pleased to submit this document that presents our findings as a result of a geotechnical engineering study of this project to our client. The project site is located approximately 900 feet to the east of the intersection of Mile 11 N Road and Mile 1 ½ W Road and the project site being on the north side of Mile 11 N Road in Mercedes, Hidalgo County, Texas. The project location is shown on the Project Location Map, found in the Appendix section of this report. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendation, for foundation design and construction considerations.

Our scope of services for the project was outlined in Work Authorization No. 2, Approved January 15, 2019.

2.0 PROJECT DESCRIPTION

It is our understanding that the proposed site will accommodate the construction of a new operations building. It is also our understanding that the proposed operations building will consist of a one (1) story structure. The site construction for the proposed structure is anticipated to be on a slab-on-grade or on-fill foundation provided expansive, soil-related movements will not impair the performance of the structure.

The site will also accommodate the construction of either a rigid or flexible pavement that will serve for light duty and/or heavy duty traffic. Both flexible and rigid pavement types are viable and the selection on the type to be used will depend on the specific needs and criteria of this project site.

3.0 SCOPE AND LIMITATIONS OF STUDY

This engineering report has been prepared in accordance with accepted geotechnical engineering practices currently exercised by geotechnical engineers in this area. No warranty, expressed or implied, is made or intended. This report is intended for the exclusive use by the client and client's authorized project team for use in preparing design and construction documents for this project only. This report may only be reproduced in its entirety for inclusion in construction documents. This report in its entirety shall not be reproduced or used for any other purposes without the written consent of our firm. This report may not contain sufficient information for purposes of other parties or other uses and is not intended for use in determining construction means and methods.

The recommendations presented in this report are based on data obtained from the soil borings drilled at this site and our understanding of the project information provided to us by our client and other project team members, and the assumption that site grading will result in only minor changes in the existing topography. Subsurface soil conditions have been observed and interpreted at the boring locations only.

This report may not reflect the actual variations of the subsurface conditions across the subject site. It is important to understand that variations may occur due to real geologic

conditions or previous uses of the site. The nature and extent of variations across the subject site may not become evident until specific design locations are identified and/or construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time during the design phase and/or construction phase, we should be notified immediately to determine if our opinions, conclusions and recommendations need to be reevaluated. It may be necessary to perform additional field and laboratory tests and engineering analyses to establish the engineering impact of such variations. These services are additional and are not a part of our project scope.

The engineering report was conducted for the proposed project site described in this report. The conclusions and recommendations contained in this report are not valid for any other project sites. If the project information described in this report is incorrect, is altered, or if new information becomes available, we should be retained to review and modify our recommendations. These services are additional and are not a part of our project scope.

Our scope of services was limited to the proposed work described in this report, and did not address other items or areas. The scope of our geotechnical engineering study does not include environmental assessment of the air, soil, rock or water conditions on or adjacent to the site. No environmental opinions are presented in this report. If the client is concerned with environmental risk at this project site, the client should perform an environmental site assessment.

If final grade elevations are significantly different from existing grades at the time of our field activities (more than plus or minus one (1) foot), our office should be informed about these changes. If desired, we will reexamine our analyses and make supplemental recommendations.

4.0 FIELD EXPLORATION PROCEDURES

Subsurface conditions at the subject site were evaluated by five (5) 25-foot soil borings and six (6) 10-foot soil borings. The Borings were drilled at the locations shown on the Borings Location Map, found in the Appendix section of this report. This location is approximate and distances were measured using a measuring wheel, tape, angles, and/or pacing from existing references. The structural soil borings were drilled in general accordance with American Society of Testing Materials (ASTM) D 420 procedures.

As part of our sampling procedures, the samples were collected in general conformance with ASTM D 1586 procedures. Representative portions of the samples were sealed in containers to reduce moisture loss, identified, packaged, and transported to our laboratory for subsequent testing. In the laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff. The geotechnical engineering properties of the strata were evaluated by a series of laboratory tests. The results of the laboratory and field-testing are tabulated on the boring logs and Summary of Soil Sample Analyses which are found in the Attachments section of this report.

Standard penetration test results are noted on the boring logs as blows per 12 inches of penetration. Two 6 inch increments are performed for each standard penetration test. The sum of the blows for the two 6 inch increments is considered the "standard penetration resistance value" or "N-value." Where hard or very dense materials were encountered, the tests are terminated as follows: (1) when a total of 50 blows have been applied in any of the 6 inch increments, or (2) when a total of 100 blows have been applied, or (3) when there is no observed advance of the sampler in the application of 10 successive blows. The boring logs in the case of hard or very dense materials will be noted as follows: 50/3", where 50 is the number of blows applied in 3 inches of penetration, or 100/7½" where 100 is the number of blows applied in a total of 7 ½ inches of penetration, or 10/0", where 10 is the number of blows applied in 0 inches of penetration.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client.

5.0 GENERAL SITE CONDITIONS

5.1 Site Description

The project site is located approximately 900 feet to the east of the intersection of Mile 11 N Road and Mile 1 ½ W Road and the project site being on the north side of Mile 11 N Road in Mercedes, Hidalgo County, Texas. The project location is shown on the Project Location Map, found in the Appendix section of this report. At the time of our field operations, the subject site can be described as an undeveloped tract of land. The general topography of the site is relatively flat with a visually estimated vertical relief of less than 3 feet. Surface drainage is visually estimated to be fair.

5.2 Site Geology

According to the Soil Survey of Hidalgo County, Texas, published by the United States Department of Agriculture – Soil Conservation Service, the project site appears to be located within the Comitas soil association.

- The Comitas series consist of deep, well drained, sandy soils on uplands. These soils formed in sandy and loamy sediments that have been reworked by wind. Surface runoff is very slow and permeability is moderate rapid. Slopes range from 0 to 3 percent. Areas are elongated and have the long axis parallel to the prevailing southeasterly winds. These areas range from 40 to 200 acres. The corresponding soil symbol is 8, Comitas loamy fine sand, 0 to 3 percent slopes.

5.3 Subsurface Conditions

On the basis of our borings, five (5) generalized strata that possess similar physical and engineering characteristics can describe the subsurface stratigraphy at this site. Table 5.1 summarizes the approximate strata range in our boring logs. These were prepared by visual classification and were aided by laboratory analyses of selected soil samples.

The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual details for each of the borings can be found on the boring logs in the appendix of this report.

Table 5.1. Approximate Subsurface Stratigraphy Depths.

Stratum	Range in Depth, ft[1]	Stratum Description[1]
I	0 – 6	well graded SAND to clayey SAND, brown, dry to moist, med. dense
II	6 – 12	well graded SAND to clayey SAND, brown, dry to moist, very loose
II	12 – 17	sandy fat CLAY to sandy lean CLAY, brown to tan, moist, very stiff
IV	17 - 22	sandy lean CLAY, brown to tan, moist, very stiff
V	22 – 20	fat clay, brown, dry to moist, very stiff to hard

Note 1: The stratum thickness and depths to strata interfaces are approximate. Our measurements are rounded off to the nearest foot increment and are referenced from ground surface at the time of our drilling activities. Subsurface conditions may vary between the boring locations.

5.4 Groundwater Conditions

The dry auger drilling technique was used to complete the soil borings in an attempt to observe the presence of subsurface water. During our drilling operations we encountered the groundwater table to be at approximately eight (8) feet below natural ground elevation for short term conditions. Table 5.2 summarizes the approximate groundwater and cave in depths measured in our explorations. It should be noted that the groundwater level measurements recorded are accurate only for the specific dates on which measurement were obtained and does not show fluctuations throughout the year.

Fluctuations in Groundwater levels are influenced by variations in rainfall and surface water run-off from season to season. The construction process itself may also cause variations in the groundwater level. If the subsurface water elevation is critical to the construction process the contractor should check the subsurface water conditions just prior to construction excavation activities.

Table 5.2. Approximate Groundwater and Cave-in Depths.

Boring No.	Depth to Subsurface Water, Ft[1]		Depth to Cave-In, Ft[1]	
	Time of Drilling	24 Hr. Reading	Time of Drilling	24 Hr. Reading
B-1	15	-	22	9
B-2	20	10	23	12
B-3	18	-	23	9
B-4	20	9	24	10
B-5	20	8	24	9
P-1	None	None	4	4
P-2	None	None	4	4
P-3	None	None	4	4
P-4	None	None	4	4
P-5	None	None	4	4
P-6	None	None	4	4

Note 1: Subsurface water levels and cave-in depths have been rounded to the nearest foot.

Based on the findings in our borings and on our experience in this region, we believe that groundwater seepage may be encountered during site earthwork activities. If groundwater seepage is encountered during site earthwork activities, it may be controlled using temporary earthen berms and/or conventional sump-and-pump dewatering methods.

6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

6.1 General

The analysis and recommendations presented in this report are applicable specifically to the proposed foundation structure. The data gathered from both the field and laboratory testing programs on soil samples obtained from the borings was utilized to establish geotechnical engineering parameters to develop recommendations for the proposed structure. The foundation system(s) considered in this report to provide support for the proposed structure must meet two independent criteria. One of the criteria is that the movement below the foundation structure due to compression (consolidation) or expansion (swell) of the underlying soils must be within tolerable limits. This criterion is addressed in the Soil Related Movements section of this report. The other criterion is that the dead and live loads must be distributed appropriately and the foundation structure designed with an acceptable factor of safety to minimize the potential for bearing capacity failure of the underlying soils.

Geotechnical and structural engineers in this general area consider soil movements or Potential Vertical Rise (PVR) of approximately one (1) inch or less to be within acceptable structural design tolerances for most structures but may be different depending on structure use and the desired performance of the foundation. Therefore, movements of the underlying soils are not eliminated and thus one should expect a slab foundation structure to exhibit differential vertical movements. However, structural engineers design slab foundations for the expected magnitude of soil movements without failure of the structure. More stringent soil movement criteria may be established but the owner should consider the exponential increase in cost required to design and construct a structure for such soil movements. Data obtained in this study indicate that the soils at this site have strength characteristics capable of supporting the foundation and structure if designed appropriately. Stratum I is composed of well graded sand to clayey sand and has a low potential to exhibit volumetric changes (contraction and expansion). Stratum II is composed of well graded sand to clayey sand and has a low potential to exhibit volumetric changes. Stratum III is composed of sandy fat clay to sandy lean clay and has a high to moderate potential to exhibit volumetric changes. Stratum IV is composed of sandy lean clay and has a moderate potential to exhibit volumetric changes. Stratum V is composed of fat clay and has a high potential to exhibit volumetric changes. The potential for soil volumetric changes is dependent on variations in moisture contents of the underlying soils. Based on this data, this site is suitable for a slab foundation provided the subgrade is modified in accordance with the recommendations established in this report to reduce the potential for these soil volumetric changes.

6.2 Soil-Related Movements

The anticipated ground movements due to swelling of the underlying soils at this site were estimated for slab foundation construction using the Texas Department of Transportation (TxDOT) procedures of test method TEX-124-E for determining Potential Vertical Rise (PVR). A PVR value of one (1) inch or less was estimated for the stratigraphic conditions encountered in our subsurface borings. A surcharge of 1 pound per square inch for the concrete slab, an active zone of 15 feet, and dry subsurface moisture conditions were assumed in estimating the above PVR values.

The following methods are generally acceptable for use in modifying the subgrade to reduce the potential for soil movements and volumetric changes below the foundation structure.

Excavate expansive clay soils and replace with select fill.
Chemical injection of expansive clay soils.
A combination of methods 1 and 2.

The method to be used is dependent on specific site conditions. At this site the grade will most likely need to be raised to obtain the proposed Finished Floor Elevation (FFE). We recommend that the project civil engineer evaluate the proposed FFE with our recommendations to ensure that the subgrade modifications presented in the report are not diminished or compromised. Adding select fill is generally the most cost-effective

method for reducing the potential for soil related movements. Therefore, we only discuss this method in this report but we can provide details for the other methods if requested.

Based on the data obtained, the proposed FFE of 68.0 AMSL and the natural ground elevation at varying from 66.0 AMSL to 66.5 AMSL information provided by our client and our analysis of the site, we recommend the following modification (Table 6.1. Subgrade Modifications) of the subgrade at this area to accomplished finish floor elevation of the subgrade at this site. This method will maintain the potential for soil related movements to an approximate PVR value of less than one (1) inch, which is generally desired for projects of this type.

Table 6.1. Subgrade Modifications

Item	Description
1	See and adhere to the Site Preparation Recommendations section of this report.
2	Excavate existing soils to an elevation of 63.5 feet AMSL in accordance with the Site Preparation Recommendations section of this report.
3	Condition and compact twelve (12) inches of subgrade below excavated soils in accordance with the Site Preparation Recommendations section of this report.
4	Place **select fill,** to an elevation of 67.5 AMSL (a minimum of four (4) feet of select fill) condition and compact up to the proposed FFE in accordance with the Select Fill Recommendations section of this report. **The surface soils at this project site appear to be suitable soils (SC) for use as select fill. MEG needs to verify soils at time of construction.**

The PVR method of estimating expansive, soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive, soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analyses of expansive, soil-related movements were beyond the scope of the current study. It should also be noted that actual movements can exceed the calculated PVR values as a result of isolated changes in moisture content (such as leaks, landscape watering, etc.) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching and/or excavations.

6.3 Conventional Shallow Slab-on-Grade Foundation Design Criteria

As indicated previously a slab foundation may be used at this site in conjunction with the subgrade modifications listed under the Soils Related Movements section. We recommend the following soil bearing pressures, and dimensional criteria for the slab

grade beams. These recommendations ensure proper utilization of soil bearing capacity of continuous beam sections in the slab-on-grade foundation and reduce the potential of water migration from the outside to beneath the slab foundation. For structural considerations the beams may need to be greater and should be evaluated and designed by the structural engineer. Where concentrated load areas are present the grade beams or slab may be thickened and widened to serve as spread footings. Soil bearing pressures and beam dimensional criteria are as follows:

Table 6.2. Bearing Criteria

Grade Beams and Continuous Footings	
Minimum depth below finished grade:	24 inches
Maximum depth below finished grade:	36 inches
Maximum width:	30 inches
Maximum allowable bearing pressure:	2,000 psf
Spread Footings (square)	
Minimum depth below finished grade:	24 inches
Maximum depth below finished grade:	36 inches
Maximum width:	60 inches
Maximum allowable bearing pressure:	2,400 psf

The above-presented maximum allowable bearing pressures will provide a factor of safety of 3 with respect to the design soil strengths. For a slab foundation structure designed and constructed in accordance with the recommendations of this report, it is anticipated that total settlements will be in the order of one (1) inch or less. If lower anticipated total settlements are required for this project further mitigation may be required and MEG must be consulted for further recommendations.

Furthermore, the above design parameters are contingent upon the fill materials (if utilized) being selected and placed in accordance with the recommendations presented in the Select Fill Recommendations section of this report. Should select fill selection and placement differ from the recommendations presented herein, MEG should be informed of the deviations in order to reevaluate our recommendations and design criteria.

Excavations for slab on grade and spread footing foundations should be performed relatively clean and with an undisturbed bearing area. The bottom 6 inches of the excavation should be performed using a flat plate excavation bucket. The excavations should be neatly excavated. No foreign debris or undisturbed soil should be left in the footing bottom. Should there be any abundance of foreign debris or disturbed soil found, it may be necessary to re-assess the fill site of its bearing capacity suitability. If the bearing area is found to be disturbed, the bearing area will require preparation and

compaction for the entire depth of the disturbance in accordance with the Site Preparation and/or the Select Fill sections of this report.

The bearing surface of the grade beams and spread footings should be evaluated after excavation and immediately prior to concrete placement. We recommend that footing inspections be performed by a representative of MEG. The required inspections shall include inspecting for clean, dry (The moisture content should be within limits specified by the appropriate section in this report.) and undisturbed footing bottom, depth of footing, clearances from sides and size and spacing of reinforcing steel. Test results shall comply with the recommendations of this geotechnical report and shall be verified by an on-site representative of MEG.

Over excavation, if necessary, for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of over excavation depth below footing base elevation. The over excavation should then be backfilled up to the footing base elevation select fill placed in lifts of 8 inches or less in loose thickness and prepared and compacted in accordance with the Site Preparation and/or the Select Fill sections of this report. Equipment should not be operated and materials should not be placed or stockpiled within a horizontal distance equal to the excavation depth from the edge of the excavation. Excavations should not be placed next to existing structures or buried utilities/structures closer than a horizontal distance equal to the excavation depth unless some form of protection for the facilities is provided.

Water should not be allowed to accumulate at the bottom of the foundation excavation. Proper barriers such as berms or swales should be placed to divert any surface runoff away from excavations. To reduce the potential for groundwater seepage into the excavations and to minimize disturbance to the bearing area, we recommend that steel and concrete be placed as soon as possible after the excavations are completed, properly prepared and cleaned. Excavations should not be left open overnight.

6.4 BRAB Design Criteria for Slab-on-Grade Foundations

Table 6.3 list the values for criteria developed by the Building Research Advisory Board (BRAB) for the design of shallow slab-on-grade foundations. On the basis of stratigraphy encountered and the anticipated site modifications discussed earlier, the design criteria are as follows:

Table 6.3. BRAB Values

For Existing Conditions	
Effective Plasticity Index	20
Climatic Rating Cw.	15
Soil Support Index, (c)	0.18
For Proposed Conditions	
Effective Plasticity Index	18
Climatic Rating Cw.	15
Soil Support Index, (c)	0.97

Note 1: Subgrade Modifications as outlined in the recommendations of this report;

7.0 CONSIDERATIONS DURING CONSTRUCTION

7.1 Site Grading Recommendations

Site grading plans can result in changes in almost all aspects of foundation recommendations. We have prepared the foundation recommendations based on the existing ground surface; there is a two (2) feet surcharge addition for the stratigraphic conditions encountered at the time of our study. If site grading plans differ from existing grades by more than plus or minus 1 foot, we must be retained to review the site grading plans prior to bidding the project for construction. This will enable us to provide input for any changes in our original recommendations that may be required as a result of site grading operations or other considerations.

7.2 Site Drainage Recommendations

Drainage is one of the most important aspects to be addressed to ensure the successful performance of any foundation. Positive surface drainage should be implemented prior to, during and maintained after construction to prevent water ponding at or adjacent to the building facilities. It is recommended that the building and site design include rain gutters, downspouts and concrete gutters to channel runoff to paving or storm drains.

7.3 Site Preparation Recommendations

Building areas and all area to support select fill should be stripped of all vegetation and organic topsoil up to a minimum of 5 ft. beyond the building perimeters. After stripping, remove at least six (6) inches of on-site soil as measured from existing grade when excavation of existing subgrade is not recommended in other sections of this report. The excavated material, if free of organic and/or deleterious material, may be stockpiled for use in the non-structural areas of the site. Where excavation of the subgrade is

recommended in this report, the bottom of the excavation will extend at least five (5) feet beyond the limits of the planned building perimeter including canopies and sidewalks. Exposed subgrades should be thoroughly proof rolled in order to locate and compact any weak, compressible and soft spots. Proof rolling shall be in accordance with TxDOT 2014 Specification Item 216. Proof rolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proof rolling or areas where large tree roots have been removed within the limits of excavation should be removed and replaced with a suitable, compacted select fill in accordance with the recommendations presented under the Select Fill Recommendations section of this report. Proof rolling operations and any excavation/backfill activities should be observed by **MEG** representatives to document subgrade preparation.

Prior to fill placement, the exposed subgrade shall be prepared based on what option is selected from the foundation and pavement recommendations. The exposed subgrade should be prepared, moisture-conditioned by scarifying to a minimum depth as recommended in the foundation and pavement recommendations and recompacting to a minimum 98 percent of the maximum dry density as determined in accordance with ASTM D 698, moisture-density relationship. The moisture content of the subgrade should be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The soil should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.4 Select Fill Recommendations

Materials used for select fill shall meet the following requirements:

1. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base; Type A, Grades 1 through 3.
2. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base, Types B or C, Grades 1 through 5 with a minimum plasticity index of 7.
3. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base, Type E, Grade 4 with a plasticity index between and inclusive of 7 and 15. Type E material shall be defined as Caliche (argillaceous limestone, calcareous or calcareous clay particles) and may contain stone, conglomerate, gravel, sand or granular materials when these materials are in situ with the caliche. Flexible Base (Type E, Grade 4) shall conform to the following requirements:

Table 7.1. Type D, Grade 6 Requirements

Retained on Sq. Sieve	Percent Retained
2”	0
½”	20-60
No. 4	40-75
No. 40	70-90
Max. PI:	15
Max. Wet Ball PI:	15
Wet Ball Mill Max Amount:	50
Wet Ball Increase, Max Passing No. 40 sieve	20

4. Soils classified according to USCS as SM, SC, GM, GC, CL, ML and combinations of these soils. The soils shall be relatively free of organic matter. In addition to the USCS classification, select materials shall have a liquid limit of less than 40 and a plasticity index between and inclusive of 12 and 17.
5. Soils classified, as CH, MH, OH, OL and PT, under the USCS are not considered suitable for use as select fill materials at this site.

Select fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 98 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The select fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.5 Site Fill Recommendations

Site fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 98 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The site fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.6 Back Fill Recommendations

Back fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage

points above the optimum moisture content until the fill is permanently covered. The back fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.7 Utility Considerations

Utilities that project through the slab-on-grade, slab-on-fill, floating floor slabs, or any other rigid unit should be designed with some degree of flexibility or with sleeves. Such features will help reduce the risk of damage to utility facilities from soil movements related to shrinkage and expansion.

7.8 Utility Trench Recommendations

Bedding and initial backfill are buried around utility lines to support and protect the utility. The secondary backfill above the initial backfill also helps protect and support the foundation and/or pavement above. To ensure that settlement is not excessive in this secondary backfill we recommend the following:

1) If possible, trench and install utilities prior to work such as lime treatment and/or compaction of subgrade or placement of other fills or bases.
2) Place, moisture condition and compact the secondary backfill in accordance with the pertinent project requirements. Within the footprint of a building pad the secondary backfill should meet the same compaction requirements for select fill. Within the footprint of a pavement structure the secondary backfill should meet the same compaction requirements for the subgrade. When compaction of the subgrade is not specified it should meet the same compaction level of the adjacent natural ground. An alternative to compaction of secondary backfill is the use of flowable fill where secondary backfill is to be placed. If properly designed, the flowable fill can be excavated easily at a later date if necessary. No compaction and no testing is required when properly designed flowable fill is used.

7.9 Excavation, Sloping and Benching Considerations

If trenches are to extend to or below a depth of five (5) ft., the contractor or persons doing the trenching should adhere to the current Occupational Health and Safety Administration (OSHA) guidelines on trench excavation safety and protection measures. Other industry standards may be applicable. The collection of specific geotechnical data and development of a plan for trench safety, sloping, benching or various types of temporary shoring, is beyond the scope of this study.

7.10 Shallow Foundation Excavation Considerations

The Geotechnical Engineer or his representative prior to the placement of reinforcing steel and concrete should observe shallow foundation excavations. This is necessary to verify that the bearing soils at the bottom of the excavations are similar to those encountered during the subsurface soil exploration phase and that excessive loose materials and water are not present in the excavations. If soft pockets of soil are

encountered in the foundation excavations, they should be removed and replaced with a compacted non-expansive fill material or lean concrete up to the design foundation bearing elevation.

7.11 Landscaping Considerations

Even though landscaping is a vital aesthetic component of any project, the owner, client and design team should be aware that placing trees or large bushes adjacent to any structure may distress the structure in the future. It is recommended that if any landscaping is to be placed adjacent to the structure in this project, it should be limited to small plants and shrubs. Trees and large bushes should be placed at a distance such that at their mature height, their canopy or "drip line" does not extend over the structures. The owner, client and design team should also be aware that if any watering is to be done in connection with the landscaping for this project it should be controlled, consistent and timely. Excessive or prolonged watering is not recommended. If watering is part of the landscaping plan, termination of watering for any extended period of time may also be detrimental to the structure. It is important that the moisture level in the subsurface soils remain constant so that shrinking and swelling of soils may be mitigated.

7.12 Perimeter Foundation Cap

We recommend that a cap of impervious fill be placed around the perimeter of the foundation to mitigate the intrusion of moisture into the soils surrounding the foundation. The top eighteen inches of fill around the foundation structure should be a low permeance clay cap to keep surface water away from the foundation. The low permeance clay cap should be sloped away from the foundation at a minimum slope of 2% and the surrounding areas should have positive drainage. The low permeance clay shall meet the USCS classification of CL and meeting the requirements in Tables 7.2 Gradation Requirements and Table 7.3 Atterberg Limits Requirements. The low permeance clay shall be compacted to minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the subgrade should be maintained within the range of optimum to four (4) percentage points above the optimum moisture. If plantings are intended, add 4 to 6 inches of loam on top of the clay cap.

Table 7.2. Gradation Requirements

Sieve Size	Percent Passing (by dry weight)
1/2 inch	100
No 4	70-100
No. 200	50 – 100

Table 7.3. Atterberg Limits Requirements

Test / ASTM	Requirement
Atterberg Limits D4318	LL ≤ 45 20 ≤ PI ≤ 30

8.0 PAVEMENT SECTION RECOMMENDATIONS

8.1 General Information

The study was also performed to determine recommendations for the construction of a flexible pavement and these recommendations are presented in this report. The pavement recommendations are limited to samples taken from the existing soils within the roadway areas present at the site. The pavement design implemented for this project should be evaluated the civil engineer based on a traffic and design analysis for this project.

Recommendations for both flexible and rigid pavements are presented in this report for further evaluation by the project civil engineer. Both pavement types are viable and the selection on the type to be used will depend on the specific needs and criteria of this project site. Generally, flexible pavements have a lower initial construction cost when compared to rigid pavements. On the other hand a rigid pavement has lower maintenance cost throughout the life of the pavement structure as compared to flexible pavements. Flexible pavements generally require more frequent repairs and overlays at intervals from 6 to 10 years to meet the structural and functional requirements of the pavement during the design life. All pavements are very dependent on the condition of the soil platform on which they are supported and thus moisture conditions will play an important role in the performance of the pavement during its structure life. Proper consideration to drainage of the pavement structure and the surrounding areas is essential to the successful performance of a pavement structure.

After proof rolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in the Site Preparation section of this report to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

8.2 Soil Stabilization Recommendations

The plasticity index of the surface soils at this site is approximately 13 to 20 percent. The existing subgrade soils do require soil stabilization for soil. We recommend the addition of three (3) percent cement by weight to the existing surface soils. We also, recommend that the existing soils be tested after the pavement areas have been excavated or filled

to the top of the subgrade elevation to verify the soil stabilization. The natural ground should then be prepared as stated in the Site Preparation Recommendations of the pavement section. Proper consideration to drainage of the pavement structure and the surrounding areas is essential to the successful performance of a pavement structure.

8.3 Design Methodology and Traffic Information

Our engineering analysis of the pavement type considered the information obtained from our soil borings, the field and laboratory testing, our past experience with similar soils and site conditions. Design of new pavements for the project has been based on the procedures outlined in the 1993 Guide for Design of Pavement Structures by the American Association of State Highway and Transportation Officials (AASHTO). The client did not provide projected ESALs. We recommend that the project Civil Engineer or a Traffic Engineer review the project for the appropriate traffic levels and design periods to ensure that they are appropriate and consistent with the specific project site requirements. The assumptions for traffic used in the pavement design analysis are as follows:

Table 8.1. Flexible Pavement Traffic Criteria Utilized

Criteria	Value[1]
Reliability Level	80%
Standard Deviation	0.45
Initial Serviceability level	4.0
Terminal Serviceability level	2.0

Note 1: The above traffic criteria as per 1993 AASHTO Pavement Design Guidelines.

Table 8.2. Rigid Pavement Traffic Criteria Utilized

Criteria	Value[1]
Reliability Level	95%
Standard Deviation	0.35
Initial Serviceability level	4.0
Terminal Serviceability level	2.0

Note 1: The above traffic criteria as per 1993 AASHTO Pavement Design Guidelines.

8.4 Recommended Pavement Sections

The proposed pavement section for entrances, drives and parking areas may be chosen from one of the following options in the tables below.

The selection process of the appropriate pavement option should consider the following:

1. The client should consider the options presented as minimum pavement sections for the appropriate use and expected traffic levels. The civil engineer of record should evaluate the minimum pavement sections recommended with the appropriate class of pavement required for this project. The local government requirements should be met when they are more stringent than the minimum pavement sections recommended in our report.

Table 8.3. Flexible Pavement Options

Materials	Light Duty[1]	Heavy Duty[2]
Asphaltic Concrete (In)	2.0	3.0
Untreated Caliche Base (In)	8.0	12.0
Cement Treated Subgrade (In)	6.0	10.0

Note 1: Light Duty Pavement (ESALS = 25,000)
Note 2: Heavy Duty Pavement (ESALs = 400,000)

Table 8.4. Rigid Concrete Pavement Options

Materials	Light Duty[1]	Heavy Duty[2]
Reinforced Concrete Pavement (In)	6.0	8.0
Untreated Caliche Base (In) or Cement Treated Subgrade (In)	6.0	10.0

Note 1: Light Duty Pavement (ESALs =25,000)
Note 2: Heavy Duty Pavement (ESALs = 400,000)

It is recommended that concrete pavements be reinforced. At a minimum, the reinforcing bars should be placed as follows:

Table 8.5. Longitudinal Drives and Entrances

Thickness (in)	Bar Size	Longitudal Spacing (in)	Transverse Spacing (in)
<=6	3	12	24
<=7	4	12	24
<=8	5	11	22

Table 8.6. Parking Areas

Thickness (in)	Bar Size	Longitudal Spacing (in)	Transverse Spacing (in)
<=6	3	16	16
<=7	4	16	16
<=8	4	14.5	14.5

Longitudinal reinforcement should be placed at ½ the slab depth +/- ½ inch from the surface. At a longitudinal edge, the first two spacing's for longitudinal reinforcement shall be at ½ the normal longitudinal spacing. At transverse construction joints, additional longitudinal reinforcement shall be placed at a spacing one half the normal longitudinal spacing for a length of 42 inches. At transverse joints, the first two spacing's for transverse reinforcement shall be at ½ the normal transverse spacing. All reinforcement should be specified as deformed steel meeting the requirement of ASTM A-615 (Grade 60) or ASTM A-616 (Grade 60). Splices should be a minimum of 33 nominal bar diameters. Reinforcing should not extend across longitudinal and expansion joints. Dowels across longitudinal and expansion joints are recommended to be 7/8-inch diameter, smooth bars with a length of 42 inches and spaced at a maximum 24 inches on center.

Longitudinal and transverse joints are recommended at a maximum spacing of 10 feet for pavements with a thickness of less than 6 inches and at a maximum spacing of 15 feet for pavements with a thickness of 6 inches or greater. The longitudinal and transverse joints should be formed or saw cut to a depth of 1/3 of the slab depth for concrete containing siliceous coarse aggregate and ¼ of the slab depth for limestone aggregate. Sawing of joints should begin as soon as the concrete will not chip and ravel. It is recommended that longitudinal and expansion joints be doweled to promote load transfer. Expansion joint spacings are not to exceed a maximum of 75 feet and no expansion or contraction joints should be located within a swale or drainage collection area. Expansion joints are also needed to separate the concrete slab from fixed objects such as inlets, light standards and buildings.

It is recommended that the concrete pavement surface have a minimum slope of 0.015 ft/ft to provide adequate surface drainage. It is recommended that the concrete pavement should cure a minimum 7 days before allowing any traffic provided that adequate concrete strength has been attained as determined by the project Civil Engineer.

The curb shall be constructed in lengths equal to the adjoining pavement slab lengths, and expansion joints shall be provided in the curb opposite each transverse expansion joint in the pavement. Expansion joint material shall be of the same thickness, type and quality as specified for the pavement and shall be of the section as shown for the curb. All expansion joints shall be carried through the curb. Transverse contraction joints shall be sawed across the curb at the same time as sawing of the transverse contraction joints in the pavement are sawed. The curb shall be placed monolithically with the pavement

for edge support and reinforced with a minimum one (1) #5 rebar. A finish coat of mortar shall be applied on the exposed surfaces of monolithic curbs.

8.5 Garbage Dumpster Considerations

Within flexible pavement areas, it is recommended that reinforced concrete pads be provided in front of and beneath garbage dumpsters. Concrete paving is also recommended in areas where the dumpster trucks make turns with small radii to access the dumpsters. The pads should be a thickened concrete slab and reinforced similar to the concrete pavement recommendations or a minimum 10 inches thick.

9.0 PAVEMENT MATERIAL SPECIFICATION SECTIONS

9.1 Pavement Preparation Recommendations

Pavement areas should be stripped of all vegetation and organic topsoil up to a minimum of two (2) feet beyond the pavement perimeters. After stripping, remove at least six (6) inches of on-site soil as measured from existing grade when excavation of existing subgrade is not recommended in other sections of this report. The excavated material, if free of organic and/or deleterious material, may be stockpiled for use in the non-pavement areas of the site. Where excavation of the subgrade is recommended in this report, the bottom of the excavation will extend at least two (2) feet beyond the limits of the planned pavement perimeter including canopies and sidewalks. Exposed subgrades should be thoroughly proof rolled in order to locate and compact any weak, compressible and soft spots. Proof rolling shall be in accordance with TxDOT 2014 Specification Item 216. Proof rolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proof rolling or areas where large tree roots have been removed within the limits of excavation should be removed and replaced with a suitable, compacted fill in accordance with the recommendations presented in TxDOT 2014 Specification Item 132 for density control and material requirements for Types A and B. If the fill is a clay it shall meet USCS Classification CL. Proof rolling operations and any excavation/backfill activities should be observed by MEG representatives to document subgrade preparation.

The exposed subgrade shall then be prepared based on what option is selected from the pavement recommendations. The soil should be worked in accordance with the recommendations and tested by MEG personnel for compaction as specified.

9.2 Hot Mix Asphaltic Concrete Surface

The asphaltic surface shall meet the requirements of the current TxDOT 2014 Specification Item 340 for Dense Graded Hot Mix Asphalt (small quantity) for projects with total production of less than 5,000 tons and TxDOT 2014 Specifications Item 341 Dense Graded Hot Mix Asphalt for projects with total production of 5,000 tons or greater. The hot mix asphaltic surface will be compacted to between 3.0 and 8.5 percent in place air voids in conformance with the specification. It is recommended that the testing required by this specification be performed during production.

Table 9.1. Dense Grade Hot Mix Asphalt Additional Requirements

Test Procedure	Requirement
Target Design Laboratory Density, %	97.0 (for light duty areas)
	96.5 (for heavy duty areas)

9.3 Reinforced Concrete

Concrete shall meet a minimum 28-day compressive strength of 3200 psi for light duty pavements and 4000 psi for medium and heavy-duty pavements and a maximum water/cement ratio of 0.45. The concrete for concrete paving shall meet the requirements for Class P Concrete of TxDOT 2014 Specification Items 360 and 421. Aggregates used in the concrete design should meet the requirements of TxDOT 2014 Specification Item 421 or ASTM C33.

9.4 Untreated Caliche Base

The base shall be caliche base and meet the requirements of TxDOT 2014 Specification Item 247 Type E, Grade 3 or better and including the requirements of Table 9.2 shown below. The base shall be compacted to a minimum 98 percent of the maximum dry density as determined by the standard moisture density relation (ASTM D 698) at moisture contents ranging between minus two (-2) and plus two (+2) percentage points of the optimum moisture content. The base shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and not less than 5 ½ inches (4 inches compacted).

Table 9.2. Flexible Base Type E, Additional Requirements

Retained Procedure	Requirements
Max. PI:	12 (15 for treated base)
Max. Wet Ball PI:	12 (15 for treated base)
Wet Ball Mill Max Amount:	50
Wet Ball Increase, Max Passing No. 40 sieve	20

9.5 Lime Treated Caliche Base

The base shall meet all the requirements of untreated caliche base. In addition, the base shall be treated with a minimum one and a half (1 ½) percent lime or Portland cement by weight. Lime shall meet the requirements of TxDOT 2014 Specification Item 260. Portland cement shall be Type I meeting ASTM C150 or Type IP meeting ASTM C595. Lime treatment will be in accordance with TxDOT 2014 Specification Item 260 or 263 for base courses and Item 260 for subgrades. Cement treatment shall be in accordance with TxDOT 2014 Specification Item 275 or 276. The base shall be compacted to a minimum 98 percent of the maximum dry density as determined by the standard moisture density relation (ASTM D 698) at moisture contents ranging between minus two (-2) and plus two

(+2) percentage points of the optimum moisture content. The base shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and not less than 5 ½ inches (4 inches compacted).

9.6 Lime Treated Subgrade

Lime stabilization of the soils may be used for soil shrink and swell mitigation and to increase the structural capacity of the subgrade as platform for the pavement. It is recommended that the subgrade plasticity index be verified after the site is stripped of the loose topsoil and the subgrade is exposed up to the subgrade elevation. Stabilization treatment of the subgrade soils may also be utilized to provide a platform for the base for resistance to moisture intrusion and changes. Prevention of moisture intrusion is extremely important to the life of a pavement. Increases in moisture content of the subgrade and the base will significantly reduce the material's structural ability to carry loads. The optimum lime content should reduce the PI of the soil to 20 or less and should result in a soil lime mixture with a pH of at least 12.4 when tested in accordance with ASTM C 977, Appendix XI. The lime should be blended with a mixing device such as a pulvermixer to produce a soil mixture passing water added and be allowed to cure for at least 48 hours. After curing the lime soil mixture it shall pass the grading requirements of TxDOT 2014 Specification Item 260 and compacted to a minimum 95 percent of the maximum dry density determined in accordance with ASTM D 698 at moisture contents ranging from minus two (-2) percentage points below optimum to plus two (+2) percentage points above optimum moisture content. If the in place gradation requirements can be achieved during the initial mixing, the remixing after the curing period can be eliminated. Please note that there is a relationship between the time of mixing of the lime and soils with the maximum dry density. Any mixture older than three (3) days will require determination of new moisture density relationships.

Portland cement may be considered instead of lime to treat the subgrade. See the cement treated subgrade section of this report.

9.7 Cement Treated Subgrade

Cement treatment of the on-site subgrade soils may be used for soil shrink and swell mitigation and to increase the structural capacity of the subgrade as a platform for the pavement. It is recommended that the subgrade plasticity index be verified after the site is stripped of the loose topsoil and the subgrade is exposed up to the subgrade elevation. Treatment of the subgrade soils may be utilized to provide a uniform platform for the base for resistance to moisture intrusion and changes. Prevention of moisture intrusion is extremely important to the life of a pavement. Increases in moisture content of the subgrade and the base will significantly reduce the material's structural ability to carry loads. The optimum cement content should be determined in accordance with TxDOT 2014 Specifications Item 275 and with a minimum dry strength requirement of 175 psi. It is anticipated that the soils will require about 2 to 3 percent cement by dry weight of the soils to meet the specification requirements. The cement should be blended into the soil and preferably with a mixing device such as a pulvermixer to produce a uniform soil-cement mixture. The soil-cement mixture shall be placed in accordance with TxDOT 2014

Specification Item 275 and compacted to a minimum 95 percent of the maximum dry density determined in accordance with ASTM D 698 at moisture contents ranging from minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content.

Cracking of the subgrade can be expected when using cement treatment due to the increased rigidity of the soil. Maintenance of any reflected cracks will require immediate sealing to keep moisture from penetrating to the pavement layers below the surface. If reflective cracking on the pavement from the treated subgrade is a concern, we recommend that microcracking of the subgrade be performed and the procedure outlined in TxDOT 2014 Specification Item 275 be used to mitigate reflective cracking. Microcracking should be performed on treated subgrade layers not to exceed 8 inches compacted thickness.

9.8 Moisture Conditioned Subgrade

The subgrade shall be scarified to a depth of eight (8) inches and moisture conditioned to within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content. The subgrade shall be compacted to a minimum 95 percent of the maximum dry density determined in accordance with ASTM D 698.

10.0 OTHER CONSIDERATIONS

10.1 Drainage

Adequate perimeter drainage is essential for long-term performance of any pavement structure. Infiltration of surface water from unpaved areas surrounding the pavement should be minimized. We do not recommend the placement of landscape beds on the paved areas. Such design features provide a potential for water to enter into the pavement section and the underlying soil subgrade. This is especially true with time in paved areas that have limited traffic and lead to accelerated asphalt oxidation and thus cracking. Water intrusion will result in the deterioration of the pavement materials with time as vehicular traffic passes over affected areas. Above grade planter boxes with drainage discharge onto the top of the pavement or directed into storm sewers should be considered if landscape features are to be used.

10.2 Curb & Gutters

Base material under curb and gutters and curbs shall be compacted to the same requirements as other areas. It is recommended that the base shall be placed below the curb & gutter and extended past the back of the curb & gutter a minimum of one and a half (1 ½) feet. The thickness of the base below the curb & gutter shall be the required pavement base thickness less six (6) inches. An adequate seal should be provided at all concrete- asphalt interfaces. It is recommended that a crack sealant compatible to both asphalt and concrete be used.

10.3 Maintenance

A maintenance plan is recommended for the long-term performance of the paved areas. Asphaltic pavements have a tendency to strip and become oxidized with exposure to the elements. Thus cracks may become present in the pavement. It is recommended that a maintenance schedule of crack sealing, fog seals and overlays be used over the life of the pavement.

11.0 PROJECT REVIEW AND QUALITY CONTROL

Each project site is unique and it is important that the appropriate design data, construction drawings, specifications, change orders and related documents be reviewed by the respective design and construction professionals participating in this project. The performance of foundations, construction building pads and/or parking areas for this project will depend on correct interpretation of our geotechnical engineering report and proper compliance of and adherence to our geotechnical recommendations and to the construction drawings and specifications.

It is important that **MEG** be provided the opportunity to review the final design and construction documents to check that our geotechnical recommendations are properly interpreted and incorporated in the design and construction documents. We cannot be responsible for misinterpretations of our geotechnical recommendations if we have not had the opportunity to review these documents. This review is an additional service and not part of our project scope.

MEG should be retained to provide construction materials testing and observation services during all phases of the construction process of this project. As the Geotechnical Engineer of Record, it is important to let our technical personnel provide these services to make certain that our recommendations are interpreted properly and to ensure that actual field conditions are those described in our geotechnical report. Since our personnel are familiar with this project, **MEG**'s participation during the construction phase of this project would help mitigate any problems resulting from variations or anomalies in subsurface conditions, which are among the most prevalent on construction projects and often lead to delays, changes, costs overruns, and disputes. If the client does not follow all of our recommendations presented in this report and/or addendums to this report, the client assumes the responsibility and liability of such actions and will hold our firm harmless and without responsibility and liability for client's actions.

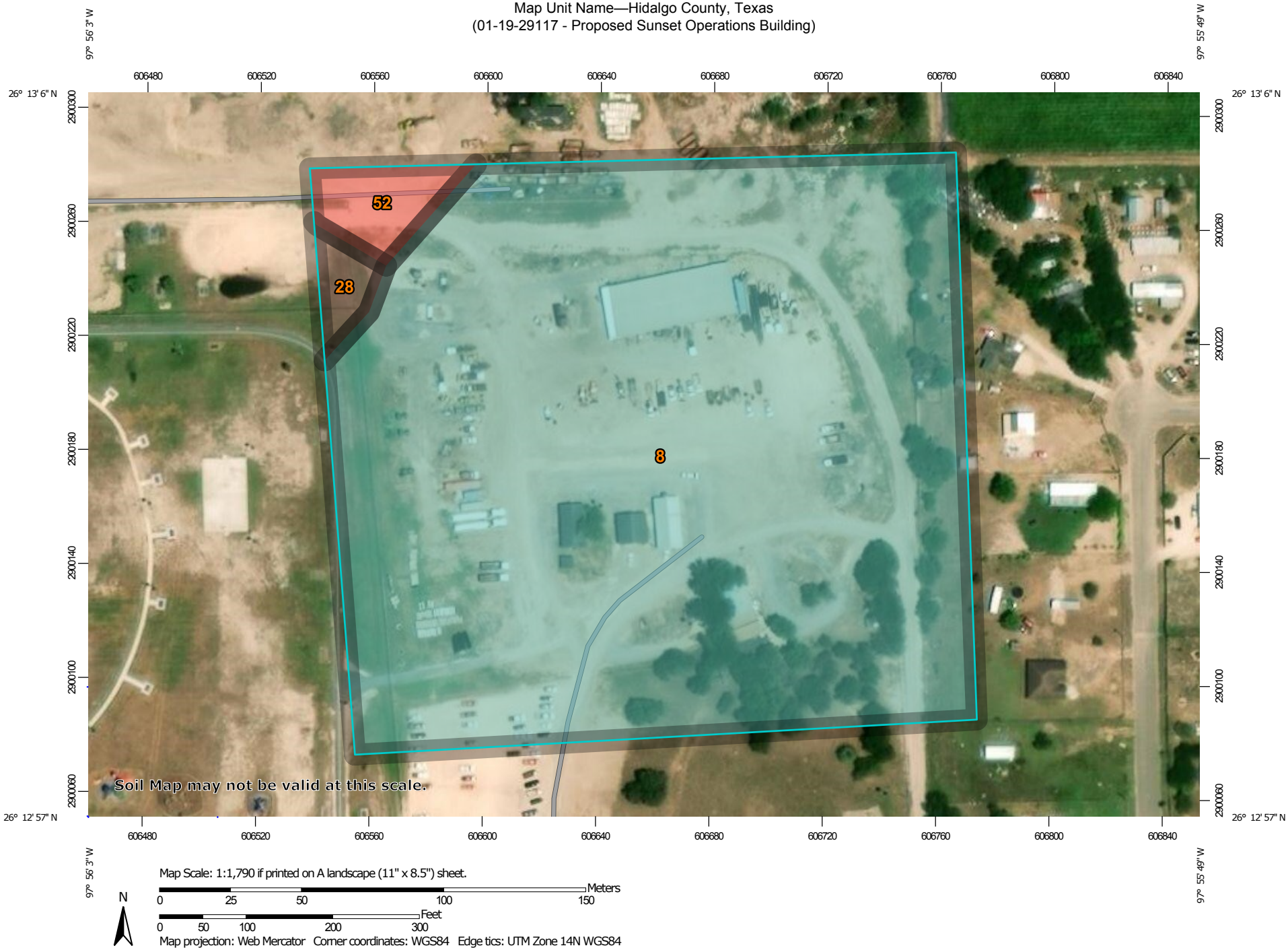
A construction testing frequency plan and budget needs to be developed for the required construction materials engineering and testing services for this project. Before construction, we recommend that **MEG**, the project design team members and the project general contractor meet and jointly develop the testing plan and budget, as well as review the testing specifications as it pertains to this project. **A failure to implement a complete testing plan will negate the recommendations provided in this report.**

MEG looks forward to the opportunity to provide continued support on this project.

APPENDIX A

CUSTOM SOIL RESOURCE REPORT

Map Unit Name—Hidalgo County, Texas
(01-19-29117 - Proposed Sunset Operations Building)



Map Scale: 1:1,790 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Comitas loamy fine sand, 0 to 3 percent slopes
- Hidalgo sandy clay loam, 0 to 1 percent slopes
- Raymondville clay loam, 0 to 1 percent slopes
- Not rated or not available

Soil Rating Lines

- Comitas loamy fine sand, 0 to 3 percent slopes
- Hidalgo sandy clay loam, 0 to 1 percent slopes
- Raymondville clay loam, 0 to 1 percent slopes
- Not rated or not available

Soil Rating Points

- Comitas loamy fine sand, 0 to 3 percent slopes
- Hidalgo sandy clay loam, 0 to 1 percent slopes
- Raymondville clay loam, 0 to 1 percent slopes
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hidalgo County, Texas
Survey Area Data: Version 17, Sep 15, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 20, 2015—Nov 5, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Name

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Comitas loamy fine sand, 0 to 3 percent slopes	Comitas loamy fine sand, 0 to 3 percent slopes	10.8	95.8%
28	Hidalgo sandy clay loam, 0 to 1 percent slopes	Hidalgo sandy clay loam, 0 to 1 percent slopes	0.2	1.5%
52	Raymondville clay loam, 0 to 1 percent slopes	Raymondville clay loam, 0 to 1 percent slopes	0.3	2.8%
Totals for Area of Interest			**11.3**	**100.0%**

Description

A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

APPENDIX B

PROJECT LOCATION, TOPOGRAPHIC AND BOREHOLE LOCATION MAPS



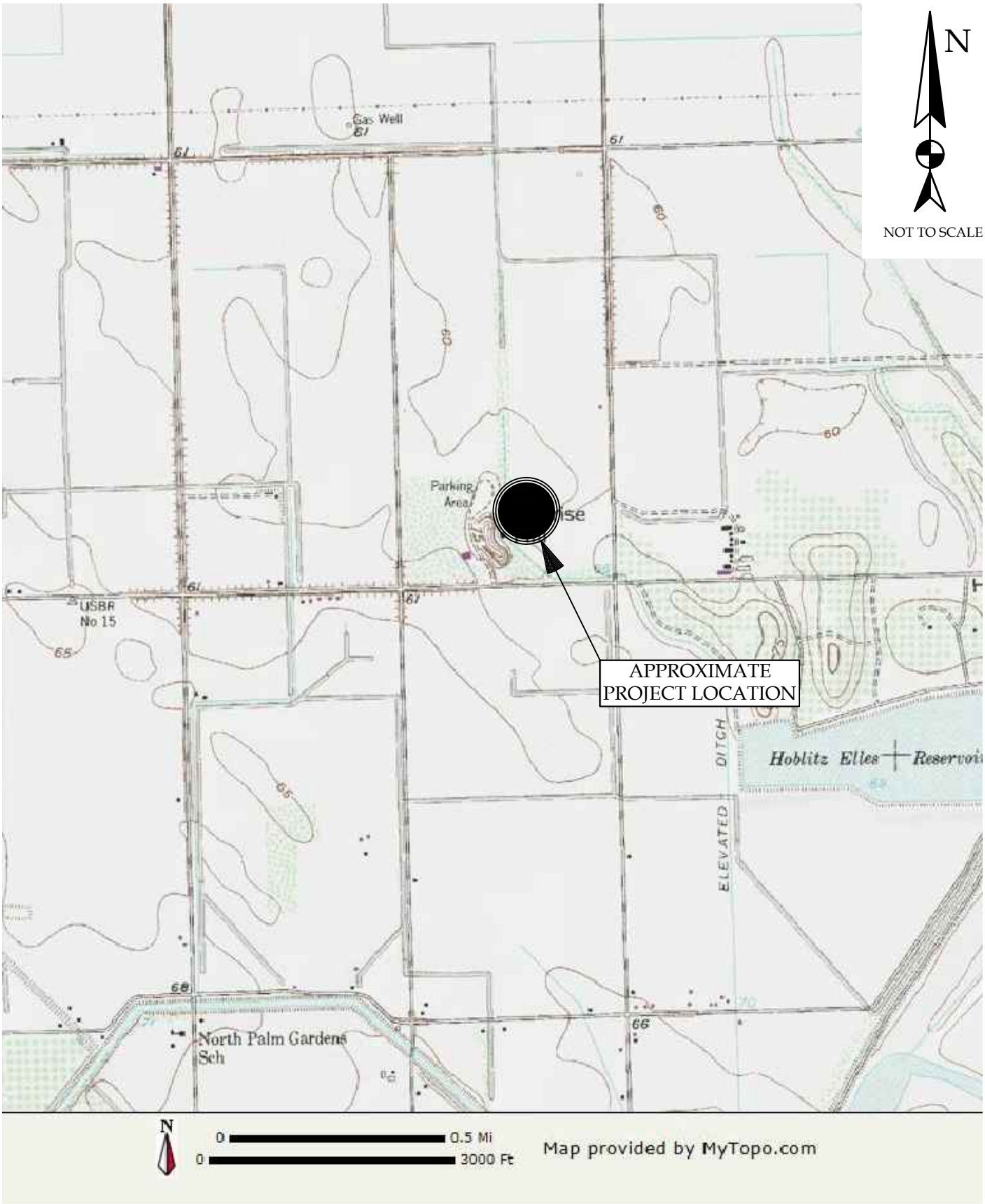
PROJECT SITE LOCATION MAP

PROPOSED
SUNSET OPERATIONS FACILITY

MERCEDES, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140

MEG PROJECT: 01-19-29117 / DATE: 3/8/2019 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA



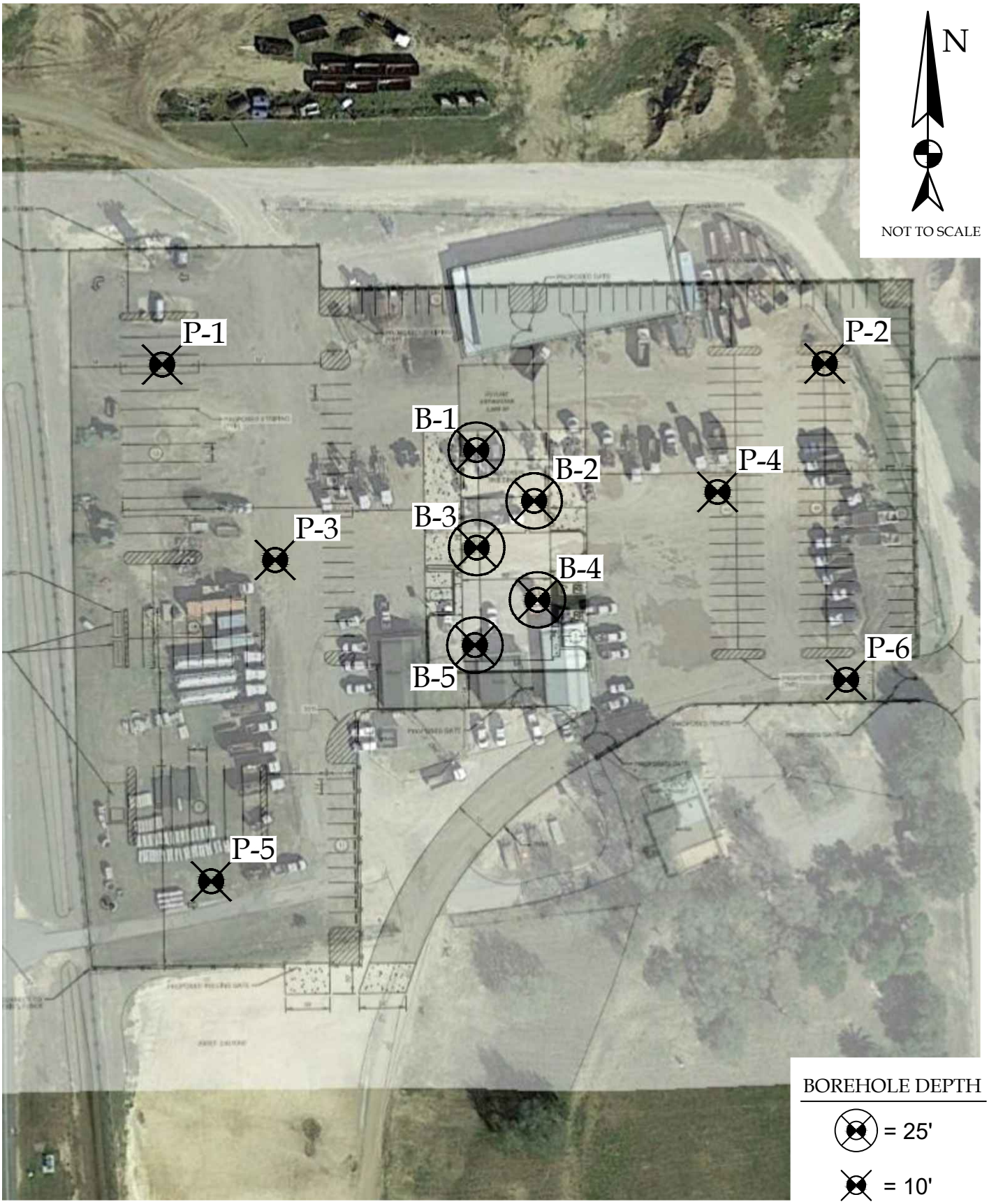
PROJECT TOPOGRAPHY MAP

PROPOSED
SUNSET OPERATIONS FACILITY

MERCEDES, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
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FAX: 956-702-8140

MEG PROJECT: 01-19-29117 / DATE: 3/8/2019 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA



PROJECT BOREHOLE LOCATION MAP

PROPOSED
SUNSET OPERATIONS FACILITY
MERCEDES, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140

MEG PROJECT: 01-19-29117 / DATE: 3/8/2019 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA

APPENDIX C

PROJECT BORING LOGS AND PROFILE

Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring B-1
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **25 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **15 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, med. dense					
65	1		1	22				5			9	
64	2											
63	3		2	19				5				
62	4											
61	5		3	11				6			11	
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	14				7				
58	8											
57	9		5	11				22	29	10		
56	10											
55	11											
54	12				CL-CH		sandy fat CLAY to sandy lean clay, brown to tan, moist, very stiff					
53	13											
52	14		6	22				22	54	28		
51	15											▽ @ ATD
50	16											
49	17				CL		sandy lean CLAY, brown to tan, moist, very stiff					
48	18											
47	19		7	29				19			57	
46	20											
45	21											
44	22				CH		fat clay, brown, dry to moist, very stiff to hard					
43	23											
42	24		8	29				20	56	33		
41	25						Bottom of Boring					
40	26											
39	27											

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Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring B-2
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **25 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **20 feet ATD, 10 feet after 24 Hrs.**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	37				4	-	NP		NP = Non Plastic
64	2											
63	3		2	21				5			13	
62	4											
61	5		3	14				4			8	
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	15				15				
58	8											
57	9		5	9				21			49	
56	10											▼ @ 24 Hrs.
55	11											
54	12				CL-CH		sandy fat CLAY to sandy lean clay, brown to tan, moist, very stiff					
53	13											
52	14		6	21				17	37	15		
51	15											
50	16											
49	17				CL		sandy lean CLAY, brown to tan, moist, very stiff					
48	18											
47	19		7	23				18	49	26		
46	20											▽ @ ATD
45	21											
44	22				CH		fat clay, brown, dry to moist, very stiff to hard					
43	23											
42	24		8	36				23	50	24		
41	25						Bottom of Boring					
40	26											
39	27											

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Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring B-3
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **25 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **18 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	37				5			11	
64	2											
63	3		2	19				6			14	
62	4											
61	5		3	11				7				
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	3				10			13	
58	8											
57	9		5	8				21	39	18		
56	10											
55	11											
54	12				CL-CH		sandy fat CLAY to sandy lean clay, brown to tan, moist, very stiff					
53	13											
52	14		6	23				20	50	29		
51	15											
50	16											
49	17				CL		sandy lean CLAY, brown to tan, moist, very stiff					
48	18											▽ @ ATD
47	19		7	18				17	34	13		
46	20											
45	21											
44	22				CH		fat clay, brown, dry to moist, very stiff to hard					
43	23											
42	24		8	26				22				
41	25						Bottom of Boring					
40	26											
39	27											

Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring B-4
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **25 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **20 feet ATD, 9 feet after 24 Hrs.**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	36				5			12	
64	2											
63	3		2	15				6				
62	4											
61	5		3	11				5			13	
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	13				14		NP		NP = Non Plastic
58	8											
57	9		5	4				20			38	▼ @ 24 Hrs.
56	10											
55	11											
54	12				CL-CH		sandy fat CLAYto sandy lean clay, brown to tan, moist, very stiff					
53	13											
52	14		6	29				15	42	24		
51	15											
50	16											
49	17				CL		sandy lean CLAY, brown to tan, moist, very stiff					
48	18											
47	19		7	23				18	26	11		
46	20											▽ @ ATD
45	21											
44	22				CH		fat clay, brown, dry to moist, very stiff to hard					
43	23											
42	24		8	28				17	54	31		
41	25						Bottom of Boring					
40	26											
39	27											

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Project: **Proposed Sunset Operations Building** Project Location: **Mercedes, Hidalgo County, Texas** Project Number: **01-18-29117**	Log of Boring B-5 **Sheet 1 of 1**

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **25 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **20 feet ATD, 8 feet after 24 Hrs.**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	20				7				
64	2											
63	3		2	18				6			11	
62	4											
61	5		3	13				6				
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	16				7			11	
58	8											@ 24 Hrs.
57	9		5	8				18	26	12		
56	10											
55	11											
54	12				CL-CH		sandy fat CLAY to sandy lean clay, brown to tan, moist, very stiff					
53	13											
52	14		6	23				19			65	
51	15											
50	16											
49	17				CL		sandy lean CLAY, brown to tan, moist, very stiff					
48	18											
47	19		7	24				18	29	11		
46	20											@ ATD
45	21											
44	22				CH		fat clay, brown, dry to moist, very stiff to hard					
43	23											
42	24		8	34				19	56	30		
41	25						Bottom of Boring					
40	26											
39	27											

Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring P-1
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **10 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **15 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	17				7	38	21		
64	2											
63	3		2	25				9			17	
62	4											
61	5		3	26				11				
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	7				15			24	
58	8											
57	9		5	13				21	33	18		
56	10						Bottom of Boring					
55	11											
54	12											
53	13											
52	14											
51	15											
50	16											
49	17											
48	18											
47	19											
46	20											
45	21											
44	22											
43	23											
42	24											
41	25											
40	26											
39	27											

MEG Engineers
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Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring P-2
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **10 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **15 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	9				7			13	
64	2											
63	3		2	13				8				
62	4											
61	5		3	12				11			14	
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	10				9			10	
58	8											
57	9		5	9				18	31	17		
56	10						Bottom of Boring					
55	11											
54	12											
53	13											
52	14											
51	15											
50	16											
49	17											
48	18											
47	19											
46	20											
45	21											
44	22											
43	23											
42	24											
41	25											
40	26											
39	27											

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Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring P-3
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **10 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **15 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	9				8			16	
64	2											
63	3		2	13				8			16	
62	4											
61	5		3	6				10				
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	14				17	-	NP		NP = Non Plastic
58	8											
57	9		5	14				17	39	24		
56	10						Bottom of Boring					
55	11											
54	12											
53	13											
52	14											
51	15											
50	16											
49	17											
48	18											
47	19											
46	20											
45	21											
44	22											
43	23											
42	24											
41	25											
40	26											
39	27											

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Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring P-4
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **10 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **15 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	9				4	-	NP	15	NP = Non Plastic
64	2											
63	3		2	13				5				
62	4											
61	5		3	6				6			13	
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	14				7			9	
58	8											
57	9		5	14				23	24	10		
56	10						Bottom of Boring					
55	11											
54	12											
53	13											
52	14											
51	15											
50	16											
49	17											
48	18											
47	19											
46	20											
45	21											
44	22											
43	23											
42	24											
41	25											
40	26											
39	27											

MEG Engineers
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Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring P-5
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **10 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **15 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SW-SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	18				10	43	23		
64	2											
63	3		2	15				11			17	
62	4											
61	5		3	7				19			49	
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	14				20	38	20		
58	8											
57	9		5	26				18				
56	10						Bottom of Boring					
55	11											
54	12											
53	13											
52	14											
51	15											
50	16											
49	17											
48	18											
47	19											
46	20											
45	21											
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40	26											
39	27											

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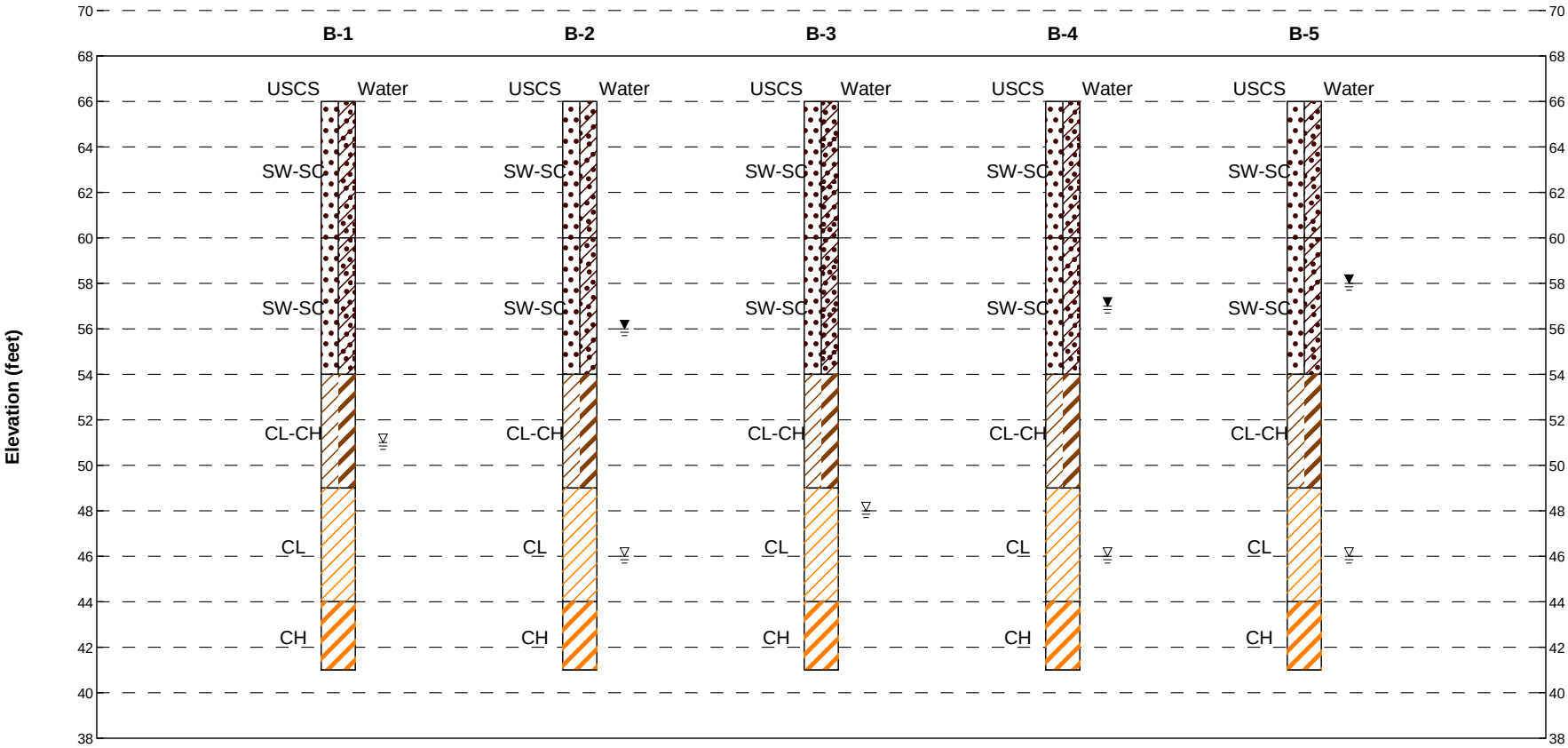
Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Log of Boring P-6
Sheet 1 of 1

Date(s) Drilled **2/14/2019**	Logged By **D. Juarez**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **10 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **Jedi Drilling**	Approximate Surface Elevation **66.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **15 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
66	0				SC		well graded SANDto clayey SAND, brown, dry to moist, very loose to med. dense					
65	1		1	16				5			14	
64	2											
63	3		2	17				6				
62	4											
61	5		3	11				6			16	
60	6				SW-SC		well graded SAND to clayey SAND, brown, dry to moist, very loose					
59	7		4	10				12	21	3		
58	8											
57	9		5	11				10	27	11		
56	10						Bottom of Boring					
55	11											
54	12											
53	13											
52	14											
51	15											
50	16											
49	17											
48	18											
47	19											
46	20											
45	21											
44	22											
43	23											
42	24											
41	25											
40	26											
39	27											

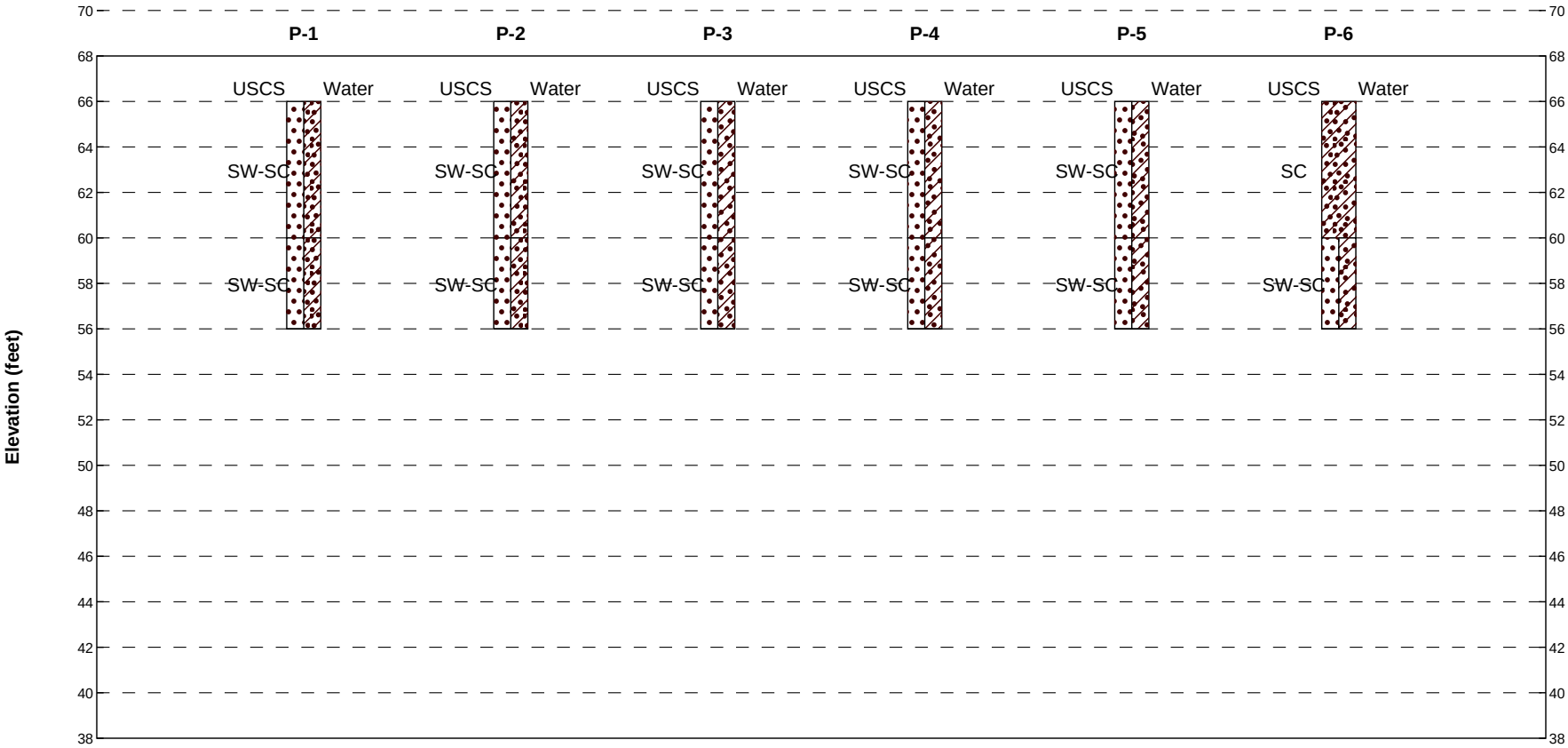
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MATERIAL GRAPHIC SYMBOLS

- Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
- Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
- Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
- Well graded SAND with Clay (SW-SC)

Millennium Engineers Group, Inc.	
Proposed Sunset Operations Building	
Project No.	**Figure No.**
01-19-29117	C-1



MATERIAL GRAPHIC SYMBOLS

Clayey SAND (SC)

Well graded SAND with Clay (SW-SC)

Millennium Engineers Group, Inc.	
Proposed Sunset Operations Building	
Project No.	**Figure No.**
01-19-29117	C-1

Project: **Proposed Sunset Operations Building**
Project Location: **Mercedes, Hidalgo County, Texas**
Project Number: **01-18-29117**

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10	11	12	13

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. Material Type: Type of material encountered.
7. Graphic Log: Graphic depiction of the subsurface material encountered.
8. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9. Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
10. LL, %: Liquid Limit, expressed as a water content.
11. PI, %: Plasticity Index, expressed as a water content.
12. Percent Fines: The percent fines (soil passing the No. 200 Sieve) in the sample. WA indicates a Wash Sieve, SA indicates a Sieve Analysis.
13. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
Clayey SAND (SC)
Well graded SAND with Clay (SW-SC)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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Figure B-1

APPENDIX D

SIEVE ANALYSIS CHARTS

Sieve Analysis Data Sheet

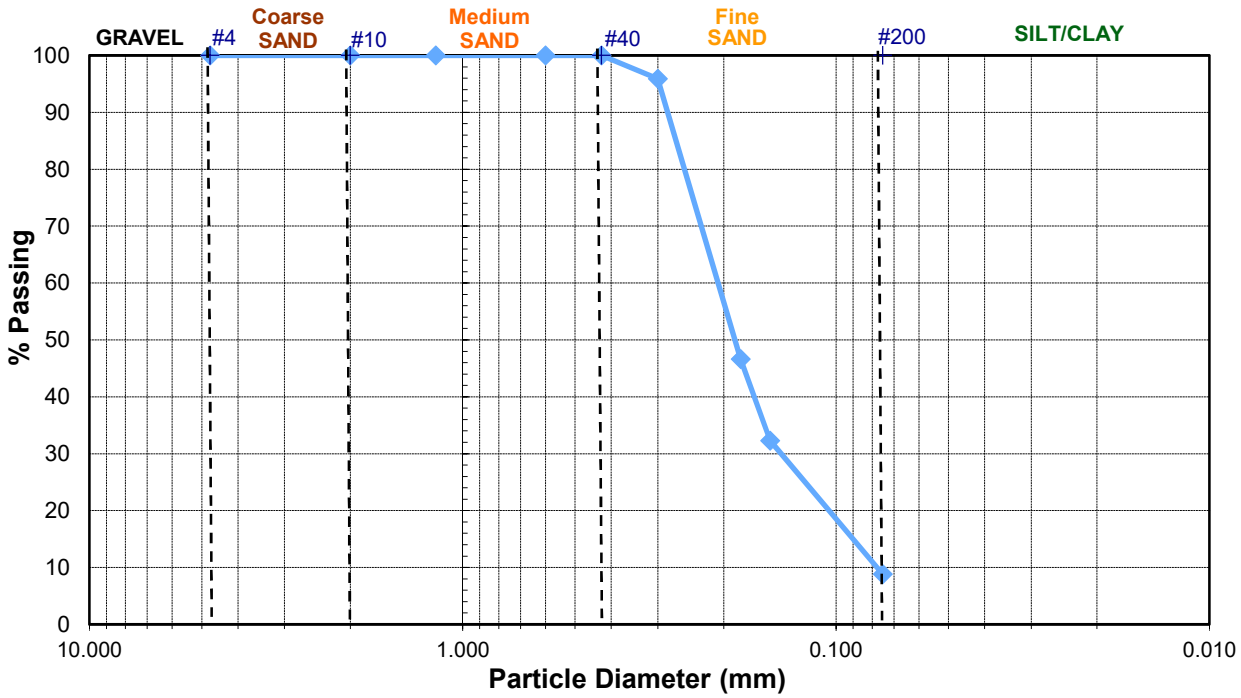
ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	B1	**Elevation:**	0.5 feet to 2 feet		

Weight of Container (g): 3583.7 **Weight of Container & Soil (g):** 3720.9

Weight of Dry Sample (g): 137.2

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.0	0.0	0.0	100.0
10	2.000	680.5	680.5	0.0	0.0	100.0
16	1.180	427.7	427.7	0.0	0.0	100.0
30	0.600	399.3	399.3	0.0	0.0	100.0
40	0.425	269.3	269.3	0.0	0.0	100.0
50	0.300	256.6	262.2	5.6	4.1	95.9
80	0.180	256.0	323.6	67.6	49.3	46.6
100	0.150	235.2	254.9	19.7	14.4	32.3
200	0.075	218.6	250.8	32.2	23.5	8.8
Pan +	-200 washed	490.5	502.6	12.1	8.8	0.0
			TOTAL:	**137.2**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	0.079	**C_u:**	2.70
% Sand:	91.2	**D_{30}:**	0.143	**C_c:**	1.22
% Fines:	8.8	**D_{60}:**	0.213		

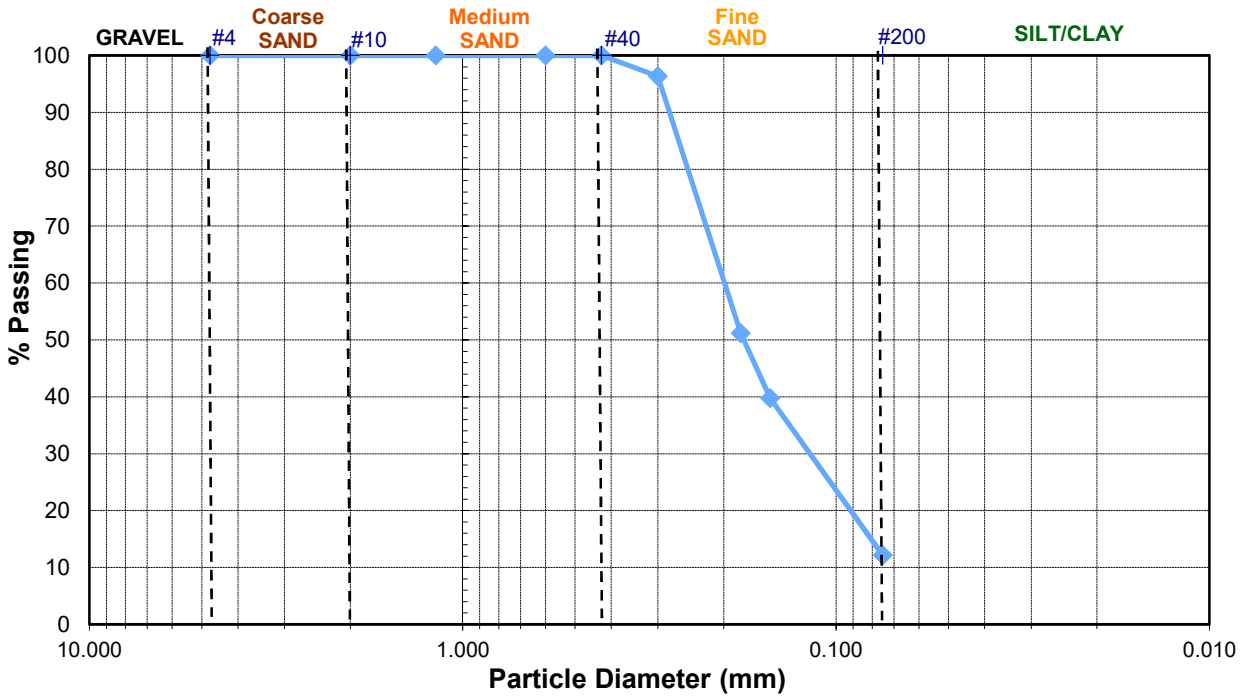
Sieve Analysis Data Sheet

ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	B1	**Elevation:**	4.5 feet to 6 feet		

Weight of Container (g):	3583.7	**Weight of Container & Soil (g):**	3753.1
Weight of Dry Sample (g):	169.4		

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.0	0.0	0.0	100.0
10	2.000	680.5	680.5	0.0	0.0	100.0
16	1.180	427.7	427.7	0.0	0.0	100.0
30	0.600	399.3	399.3	0.0	0.0	100.0
40	0.425	269.3	269.3	0.0	0.0	100.0
50	0.300	256.6	262.8	6.2	3.7	96.3
80	0.180	256.0	332.5	76.5	45.2	51.2
100	0.150	235.2	254.5	19.3	11.4	39.8
200	0.075	218.6	265.4	46.8	27.6	12.2
Pan +	-200 washed	490.5	511.1	20.6	12.2	0.0
			TOTAL:	**169.4**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	N/A	**C_u:**	N/A
% Sand:	87.8	**D_{30}:**	0.123	**C_c:**	N/A
% Fines:	12.2	**D_{60}:**	0.203		

Sieve Analysis Data Sheet

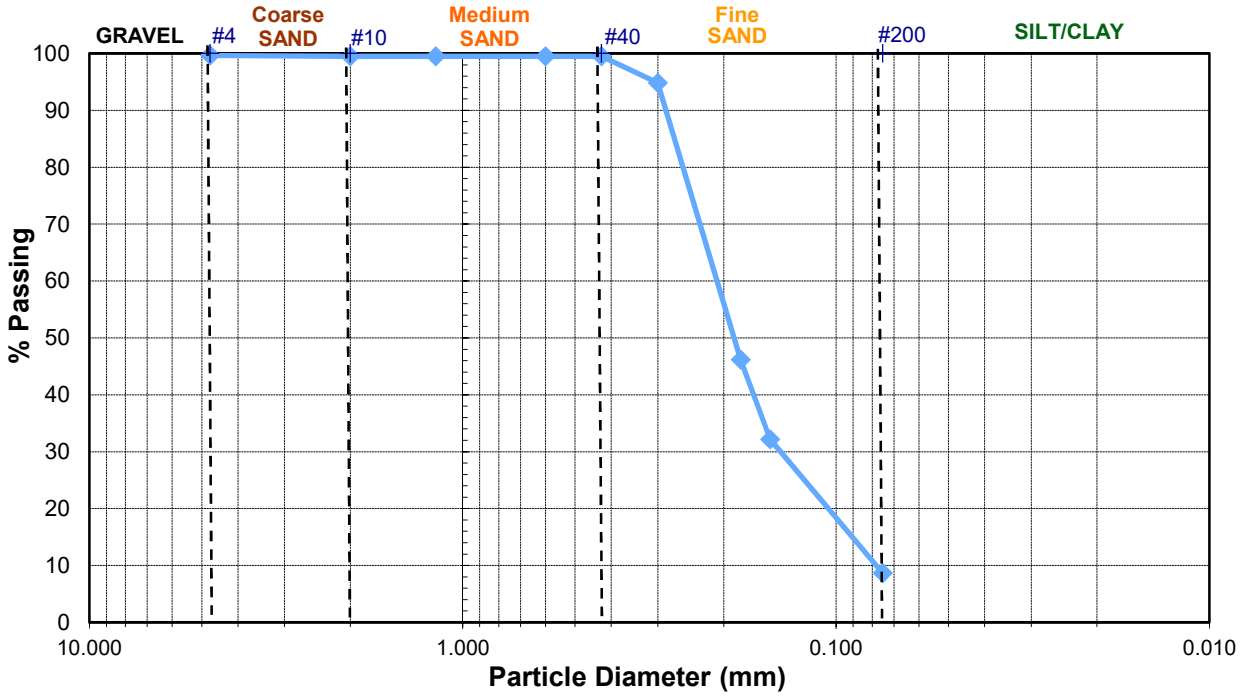
ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	B2	**Elevation:**	4.5 feet to 6 feet		

Weight of Container (g): 3583.7 **Weight of Container & Soil (g):** 3725.7

Weight of Dry Sample (g): 142.0

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.5	0.5	0.4	99.6
10	2.000	680.5	680.7	0.2	0.1	99.5
16	1.180	427.7	427.7	0.0	0.0	99.5
30	0.600	399.3	399.3	0.0	0.0	99.5
40	0.425	269.3	269.3	0.0	0.0	99.5
50	0.300	256.6	263.2	6.6	4.6	94.9
80	0.180	256.0	325.1	69.1	48.7	46.2
100	0.150	235.2	255.1	19.9	14.0	32.2
200	0.075	218.6	252.0	33.4	23.5	8.7
Pan +	-200 washed	490.5	502.8	12.3	8.7	0.0
			TOTAL:	**142**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	0.079	**C_u:**	2.70
% Sand:	91.3	**D_{30}:**	0.143	**C_c:**	1.21
% Fines:	8.7	**D_{60}:**	0.214		

Sieve Analysis Data Sheet

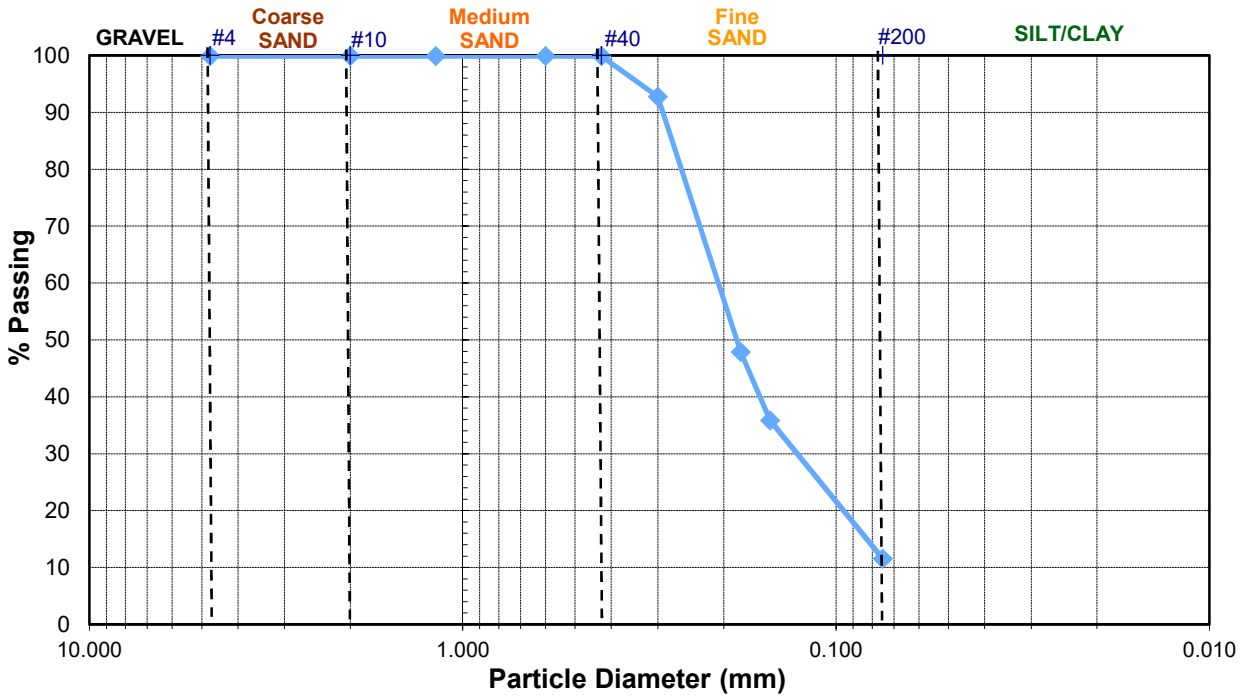
ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	B3	**Elevation:**	0.5 feet to 2 feet		

Weight of Container (g): 3583.7 **Weight of Container & Soil (g):** 3825.1

Weight of Dry Sample (g): 241.4

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.3	0.3	0.1	99.9
10	2.000	680.5	680.5	0.0	0.0	99.9
16	1.180	427.7	427.7	0.0	0.0	99.9
30	0.600	399.3	399.3	0.0	0.0	99.9
40	0.425	269.3	269.3	0.0	0.0	99.9
50	0.300	256.6	273.8	17.2	7.1	92.8
80	0.180	256.0	364.3	108.3	44.9	47.9
100	0.150	235.2	264.3	29.1	12.1	35.8
200	0.075	218.6	277.3	58.7	24.3	11.5
Pan +	-200 washed	490.5	518.3	27.8	11.5	0.0
			TOTAL:	**241.4**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	N/A	**C_u:**	N/A
% Sand:	88.5	**D_{30}:**	0.132	**C_c:**	N/A
% Fines:	11.5	**D_{60}:**	0.212		

Sieve Analysis Data Sheet

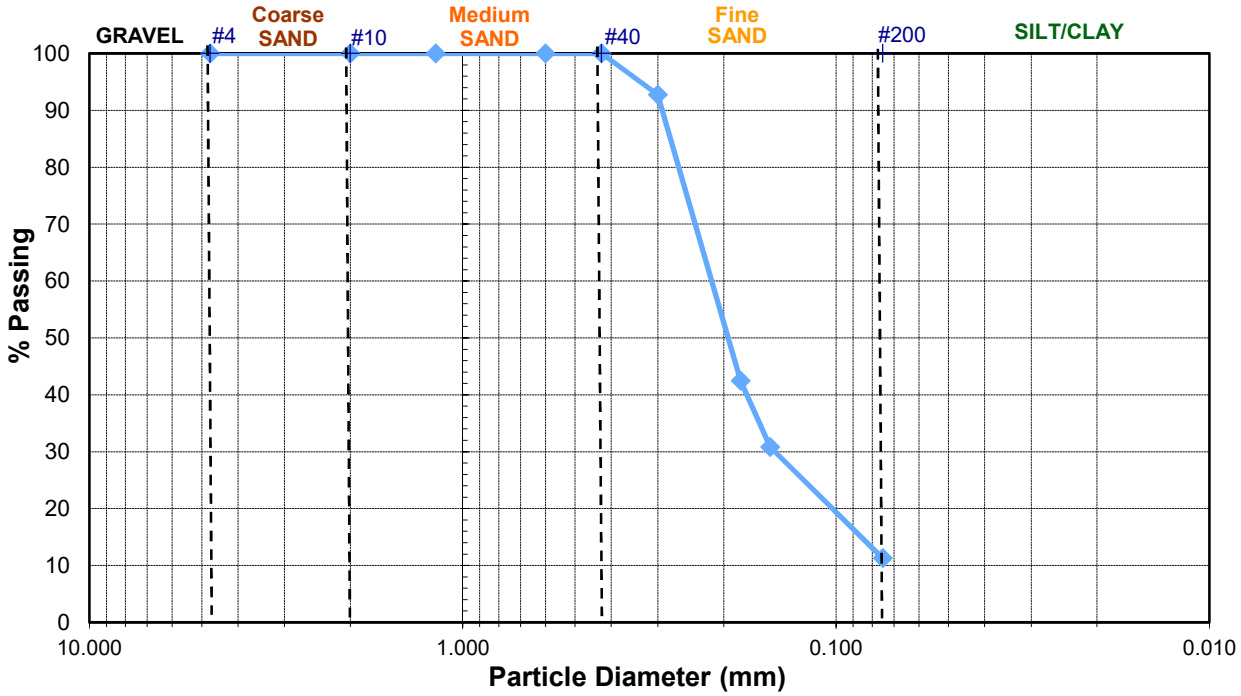
ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	B5	**Elevation:**	2.5 feet to 4 feet		

Weight of Container (g): 3583.7 **Weight of Container & Soil (g):** 3747.7

Weight of Dry Sample (g): 164.0

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.0	0.0	0.0	100.0
10	2.000	680.5	680.5	0.0	0.0	100.0
16	1.180	427.7	427.7	0.0	0.0	100.0
30	0.600	399.3	399.3	0.0	0.0	100.0
40	0.425	269.3	269.3	0.0	0.0	100.0
50	0.300	256.6	268.5	11.9	7.3	92.7
80	0.180	256.0	338.5	82.5	50.3	42.4
100	0.150	235.2	254.3	19.1	11.6	30.8
200	0.075	218.6	250.6	32.0	19.5	11.3
Pan +	-200 washed	490.5	509.0	18.5	11.3	0.0
			TOTAL:	**164**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	N/A	**C_u:**	N/A
% Sand:	88.7	**D_{30}:**	0.147	**C_c:**	N/A
% Fines:	11.3	**D_{60}:**	0.222		

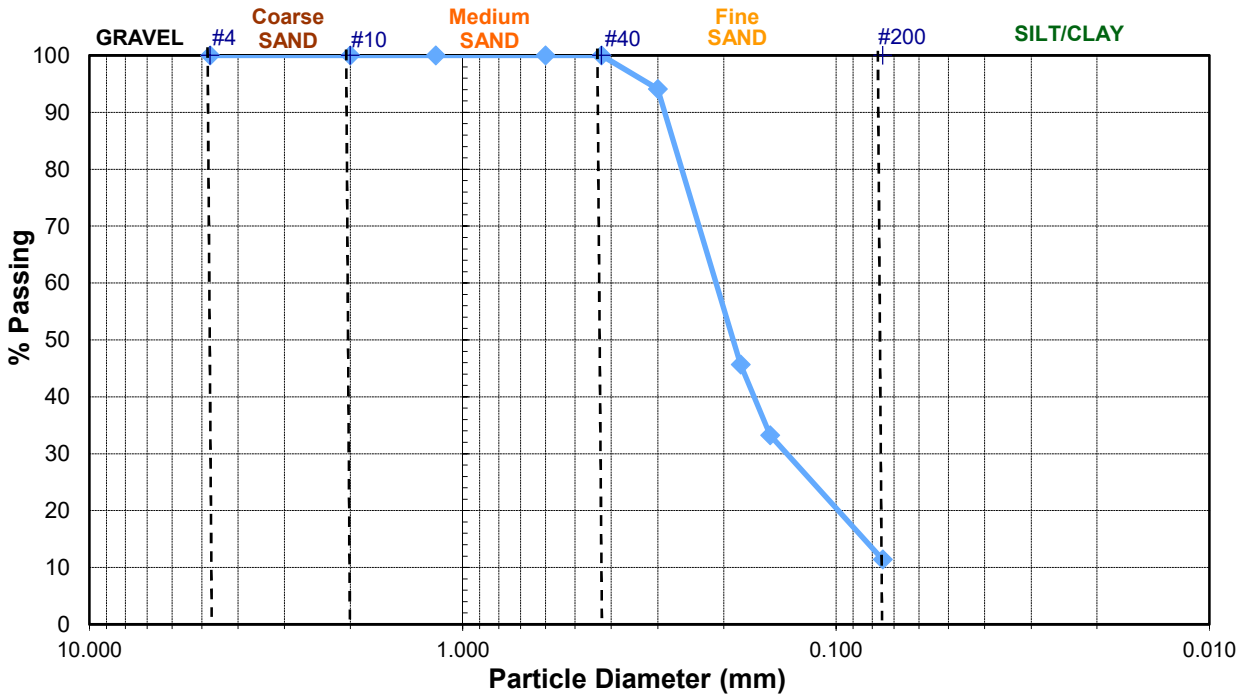
Sieve Analysis Data Sheet

ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	B5	**Elevation:**	6.5 feet to 8 feet		

Weight of Container (g):	3583.7	**Weight of Container & Soil (g):**	3747.9
Weight of Dry Sample (g):	164.2		

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.0	0.0	0.0	100.0
10	2.000	680.5	680.5	0.0	0.0	100.0
16	1.180	427.7	427.7	0.0	0.0	100.0
30	0.600	399.3	399.3	0.0	0.0	100.0
40	0.425	269.3	269.3	0.0	0.0	100.0
50	0.300	256.6	266.3	9.7	5.9	94.1
80	0.180	256.0	335.5	79.5	48.4	45.7
100	0.150	235.2	255.6	20.4	12.4	33.3
200	0.075	218.6	254.5	35.9	21.9	11.4
Pan +	-200 washed	490.5	509.2	18.7	11.4	0.0
			TOTAL:	**164.2**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	N/A	**C_u:**	N/A
% Sand:	88.6	**D_{30}:**	0.139	**C_c:**	N/A
% Fines:	11.4	**D_{60}:**	0.216		

Sieve Analysis Data Sheet

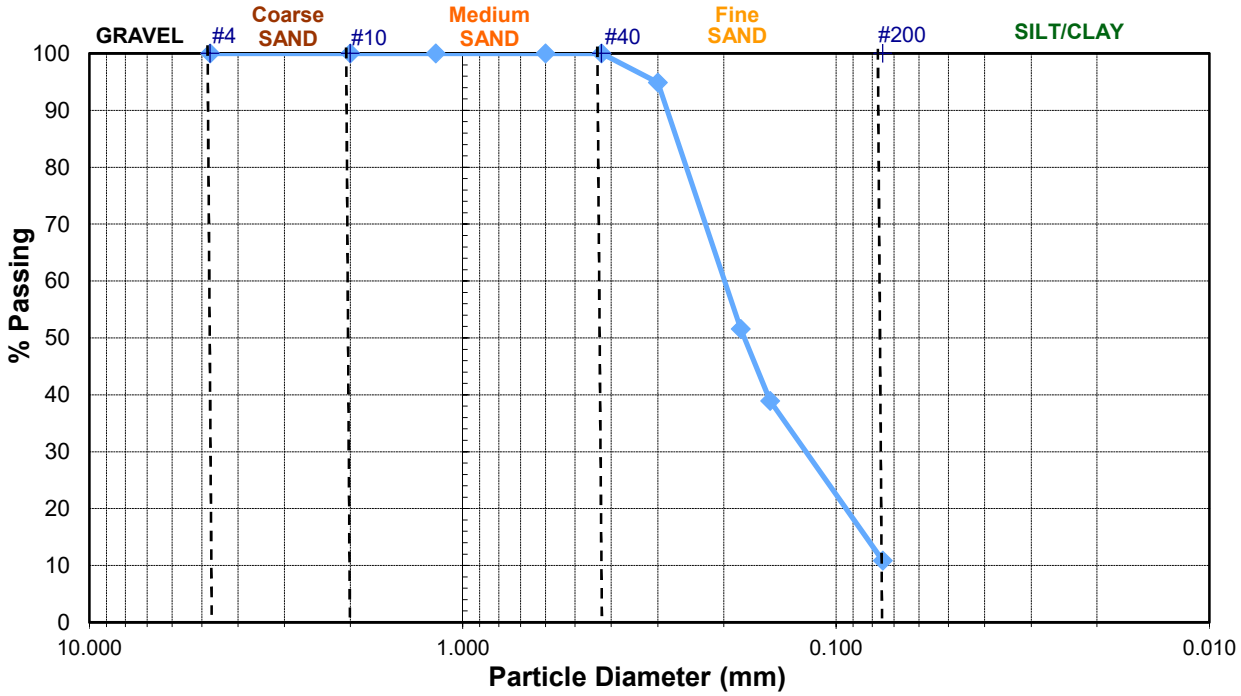
ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	P2	**Elevation:**	6.5 feet to 8 feet		

Weight of Container (g): 3583.7 **Weight of Container & Soil (g):** 3756.9

Weight of Dry Sample (g): 173.2

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.0	0.0	0.0	100.0
10	2.000	680.5	680.5	0.0	0.0	100.0
16	1.180	427.7	427.7	0.0	0.0	100.0
30	0.600	399.3	399.3	0.0	0.0	100.0
40	0.425	269.3	269.3	0.0	0.0	100.0
50	0.300	256.6	265.5	8.9	5.1	94.9
80	0.180	256.0	331.0	75.0	43.3	51.6
100	0.150	235.2	257.1	21.9	12.6	38.9
200	0.075	218.6	267.2	48.6	28.1	10.9
Pan +	-200 washed	490.5	509.3	18.8	10.9	0.0
			TOTAL:	**173.2**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	N/A	**C_u:**	N/A
% Sand:	89.1	**D_{30}:**	0.126	**C_c:**	N/A
% Fines:	10.9	**D_{60}:**	0.203		

Sieve Analysis Data Sheet

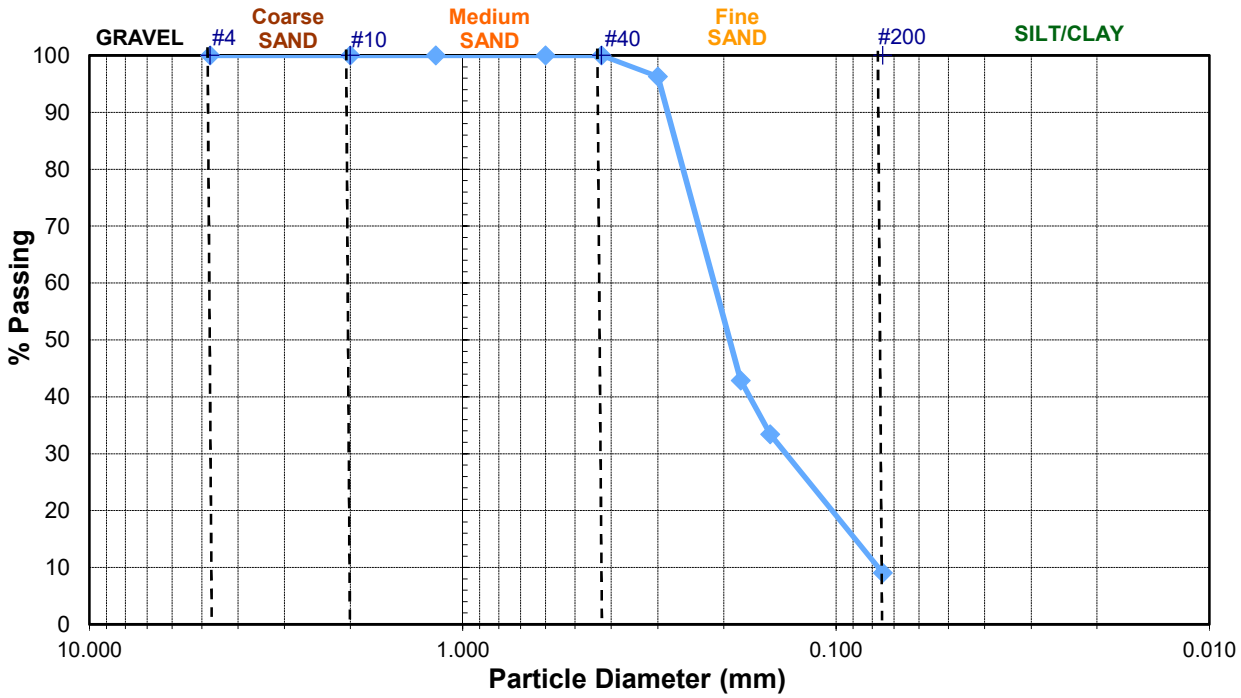
ASTM D-2487

Project Name:	Sunset Operations Building	**Tested By:**	D. Juarez	**Date:**	3/1/2019
Project No.:	01-19-29117	**Checked By:**	J. Palma	**Date:**	3/4/2019
Location:	Mercedes, Texas				
Borehole No.:	P4	**Elevation:**	6.5 feet to 8 feet		

Weight of Container (g): 3583.7 **Weight of Container & Soil (g):** 3787.5

Weight of Dry Sample (g): 203.8

Sieve Number	Diameter (mm)	Mass of Empty Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
4	4.750	350.0	350.0	0.0	0.0	100.0
10	2.000	680.5	680.5	0.0	0.0	100.0
16	1.180	427.7	427.7	0.0	0.0	100.0
30	0.600	399.3	399.3	0.0	0.0	100.0
40	0.425	269.3	269.3	0.0	0.0	100.0
50	0.300	256.6	264.1	7.5	3.7	96.3
80	0.180	256.0	365.0	109.0	53.5	42.8
100	0.150	235.2	254.4	19.2	9.4	33.4
200	0.075	218.6	268.3	49.7	24.4	9.0
Pan +	-200 washed	490.5	508.9	18.4	9.0	0.0
			TOTAL:	**203.8**	**100.0**	



Grain Size Distribution Curve Results:

% Gravel:	0.0	**D_{10}:**	0.078	**C_u:**	2.80
% Sand:	91.0	**D_{30}:**	0.139	**C_c:**	1.14
% Fines:	9.0	**D_{60}:**	0.219		

APPENDIX E

SUMMARY OF SOIL SAMPLE ANALYSIS

Summary of Soil Sample Analyses

Project Name: Proposed Sunset Operations Building

Boring No.	Sample Depth (ft)	Blows Per (ft)	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	-200% Sieve	Shear Strength (tsf)	Dry Unit Weight (pcf)	USCS
B-1	.5 - 2	22	5				9			
	2.5 - 4	19	5							
	4.5 - 6	11	6				11			
	6.5 - 8	14	7							
	8.5 - 10	11	22	29	19	10				
	13.5 - 15	22	22	54	26	28				CH
	18.5 - 20	29	19				57			
	23.5 - 25	29	20	56	23	33				CH
B-2	.5 - 2	37	4	-	-	NP				
	2.5 - 4	21	5				13			
	4.5 - 6	14	4				8			
	6.5 - 8	15	15							
	8.5 - 10	9	21				49			
	13.5 - 15	21	17	37	22	15				CL
	18.5 - 20	23	18	49	23	26				CL
	23.5 - 25	36	23	50	26	24				CL
B-3	.5 - 2	37	5				11			
	2.5 - 4	19	6				14			
	4.5 - 6	11	7							
	6.5 - 8	3	10				13			
	8.5 - 10	8	21	39	21	18				CL
	13.5 - 15	23	20	50	21	29				CH
	18.5 - 20	18	17	34	21	13				CL
	23.5 - 25	26	22							
B-4	.5 - 2	36	5				12			
	2.5 - 4	15	6							
	4.5 - 6	11	5				13			
	6.5 - 8	13	14	-	-	NP				
	8.5 - 10	4	20				38			
	13.5 - 15	29	15	42	18	24				CL
	18.5 - 20	23	18	26	15	11				CL
	23.5 - 25	28	17	54	23	31				CH
B-5	.5 - 2	20	7							
	2.5 - 4	18	6				11			
	4.5 - 6	13	6							
	6.5 - 8	16	7				11			
	8.5 - 10	8	18	26	14	12				CL
	13.5 - 15	23	19				65			
	18.5 - 20	24	18	29	18	11				CL
	23.5 - 25	34	19	56	26	30				CH

Summary of Soil Sample Analyses

Project Name: Proposed Sunset Operations Building Project

Boring No.	Sample Depth (ft)	Blows Per (ft)	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	-200% Sieve	Shear Strength (tsf)	Dry Unit Weight (pcf)	USCS
P-1	.5 - 2	17	7	38	17	21				CL
	2.5 - 4	25	9				17			
	4.5 - 6	26	11							
	6.5 - 8	7	15				24			
	8.5 - 10	13	21	33	15	18				CL
P-2	.5 - 2	9	7				13			
	2.5 - 4	13	8							
	4.5 - 6	12	11				14			
	6.5 - 8	10	9				10			
	8.5 - 10	9	18	31	14	17				CL
P-3	.5 - 2	9	8				16			
	2.5 - 4	13	8				16			
	4.5 - 6	6	10							
	6.5 - 8	14	17	-	-	NP				
	8.5 - 10	14	17	39	15	24				CL
P-4	.5 - 2	9	4	-	-	NP	15			
	2.5 - 4	13	5							
	4.5 - 6	6	6				13			
	6.5 - 8	14	7				9			
	8.5 - 10	14	23	24	14	10				CL
P-5	.5 - 2	18	10	43	20	23				CL
	2.5 - 4	15	11				17			
	4.5 - 6	7	19				49			
	6.5 - 8	14	20	38	18	20				CL
	8.5 - 10	26	18							
P-6	.5 - 2	16	5				14			
	2.5 - 4	17	6							
	4.5 - 6	11	6				16			
	6.5 - 8	10	12	21	18	3				CL
	8.5 - 10	11	10	27	16	11				CL

NP = Non-Plastic

APPENDIX F

LABORATORY AND FIELD PROCEDURES

Laboratory and Field Test Procedures

Soil Classification Per ASTM D2487-93:

This soil-testing standard was used for classifying soils according to the Unified Soil Classification System. The soil classifications of the earth materials encountered are as noted in the attached boring logs.

Soil Water Content Per ASTM D2216-92:

This test determines the water content of soil or rock expressed as a percentage of the solid mass of the soil. The test results are listed under **MC** in the attached boring logs.

Soil Liquid Limit Per ASTM D4318-93:

The soil Liquid Limit identifies the upper limit soil water content at which the soil changes from a moldable (plastic) physical state to a liquid state. The Liquid Limit water content is expressed as a percentage of the solid mass of the soil. The test results are listed under **LL** in the attached boring logs.

Soil Plastic Limit Per ASTM D4318-93:

The soil Plastic Limit identifies lower limit soil water content at which the soil changes from a moldable (plastic) physical state to a non-moldable (semi-solid) physical state. The Plastic Limit water content is expressed as a percentage of the solid mass of the soil. The test results are listed under **PL** in the attached boring logs.

Plasticity Index Per ASTM D4318-93:

This is the numeric difference between the Liquid Limit and Plastic Limit. This index also defines the range of water content over which the soil-water system acts as a moldable (plastic) material. Higher Plasticity Index (PI) values indicate that the soil has a greater ability to change in soil volume or shrink and swell with lower or higher water contents, respectively. The test results are listed under **PI** in the attached boring logs.

Standard Penetration Test (SPT) and Split Spoon Sampler (SS) per ASTM D 1586:

This is the standard test method for both the penetration test and split-barrel (spoon) sampling of soils. This sampling method is used for soils or rock too hard for sampling using Shelby Tubes. The method involves penetration of a split spoon sampler into the soil or rock through successive blows of a 140-pound hammer in a prescribed manner.

Blow Counts (N) per ASTM D 1586:

This is the number of blows required to drive a Split Spoon Sampler by means of a 140 pound hammer for a distance of 12 inches in accordance with the variables stated in the test procedures.

Shelby Tube (ST) per ASTM D 1587:

This procedure is for using a thin-walled metal tube to recover relatively undisturbed soil samples suitable for laboratory tests of physical properties.

Dry Density (DD) per ASTM D 2937:

This procedure is for the determination of in-place density of soil. The test results are measured in pounds per cubic foot, pcf.

Unconfined Compression Test (Uc) per ASTM D 2166:

This test method covers the determination of the unconfined compressive strength of cohesive soil in the undisturbed, remolded, or compacted condition, using strain-controlled application of the axial load.

Minus No. 200 Sieve per ASTM D 1140:

This test method covers determination of the amount of material finer than a Number 200 sieve by washing. The results are stated as a percent of the total dry weight of the sample.

Pocket Penetrometer (PP):

This test method is an accepted modification of ASTM D 1558 test method for establishing the moisture-penetration resistance relationships of fine-grained soils. The test results are measured in tons per square foot, tsf. The strength values provided by this method should be considered qualitatively.

Rock Quality Designation (RQD):

The measure of the quality of a rock mass defined by adding intact rock core pieces greater than four inches in length by the total length of core advance.

Recovery Ratio (REC):

The Recovery Ratio is equal to the total length of core recovered divided by the total length of core advance.

Boring Logs:

This is a summary of the above-described information at each boring location.

SECTION 02 41 13

SELECTIVE DEMOLITION

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Partial demolition of existing building as required to accommodate additions and renovations as shown on the drawings or required. Include removal of existing utilities as indicated or encountered; removal of masonry, and mechanical, electrical, and plumbing items as indicated or required.

1.2 SUBMITTALS

A. Submit the following items.
   1. Itemized Demolition Schedule.
   2. Detail all demolition methods to be used.

1.3 PERMITS

A. Procure and pay for all necessary permits or certificates required to complete the work specified. Make any and all required notifications and comply with all applicable Federal, State and local ordinances.

1.4 QUALITY ASSURANCE

A. Provide at least one (1) person who shall be present and in charge of the Demolition Work at all times and who shall be thoroughly familiar with all phases of all work performed under this Section.

B. Comply with all pertinent codes and regulations applying to this work.

1.5 JOB CONDITIONS

A. Use all means necessary to prevent the spread of dust during performance of this work. Provide additional clean filters for the existing air handling system serving those areas to remain to protect them from construction dust.

B. Use all means necessary to protect the existing building to remain from all types of damage, including fire, water damage, and unnecessary interruption of utility services. In the event of damage of any kind, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.

C. Motor driven equipment shall have functional mufflers.

D. Visit the site and examine the existing structure. Note all conditions as to the character and extent of work involved.

1.6 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 - Notification of Architect requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide all barricades, shoring, and bracing necessary to protect the tenants, workmen, and Public from danger. Barricades shall be sufficiently designed to protect and or exclude the public from all hazards.

B. All other materials, not specifically described but required for proper completion of Work of this Section, shall be as selected by the Contractor subject to the approval of the Owner.

C. The Owner and Architect are not responsible and make no claims for the quality or quantity of the materials being demolished. The General Contractor or subcontractors that undertake or assume the benefits of salvage efforts shall assume all risks associated with that effort.

2.2 DEMOLITION WORK

A. Perform demolition work in manner so as to allow Owner's safe use of existing facility.

B. Perform demolition work in order to maintain Owner's construction schedule.

2.3 REMOVAL OF PARTITIONS, COLUMNS AND STRUCTURE

A. Masonry walls or other sections of masonry shall not be permitted to fall on floors of building in masses to exceed safe carrying capacity of floors. Existing floors shall be properly protected with plywood on both sides of a partition to be demolished.

B. Provide temporary shoring or bracing wherever necessary for the protection of occupants, workmen, walls, partitions, roofs, floors and structure to remain.

C. Structural or load-supporting members shall not be cut or removed adjacent to existing structures to remain until all loads carried by members have been removed or adequately supported.

D. No masonry walls shall be removed until it has been determined that the walls to be removed do not support the roof. To determine this, all adjacent materials such as finish ceilings shall be removed to provide adequate views of existing structure. Provide temporary shoring as needed. The Contractor shall take all precautions necessary to ensure the safety of the demolition workers and all occupants of the building.

E. No demolition will be allowed above, below, adjacent to or near any occupied areas of the building.

F. Where access holes in existing ceilings or removal of existing ceilings are required, minimize the access in order to minimize the repair work and repair or replace removed or damaged work to match adjacent undamaged work.

G. Cut and tooth new openings in masonry where required, of correct size to permit installation of frames and anchors for new doors.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Before commencing the Work of this Section, verify with the Owner that all items to be removed by the Owner have been removed. The Owner reserves the first right of refusal for all items. Schedule the work in a careful manner with all necessary consideration for the Public and the Owner. All items of existing equipment and materials or any other item of value to the Owner shall be salvaged by the Owner prior to demolition.

B. All material removed under this Contract, which is not to be salvaged or reused, shall become the property of the Contractor and be promptly removed from the site. At all times use movable debris boxes, covered, to convey the material through the building. Do not store or permit debris to accumulate on the site. Dumpsters shall not overflow and shall be emptied on a regular basis. Remove all debris from the building premises and leave the construction site "Clean" each day. All debris shall be dumped in an approved disposal facility and all fees for this shall be paid by the Contractor. Contractor is responsible for completely removing all demolished materials from the site and disposing of them in accordance with all local, State and Federal Regulations. If Contractor fails to remove debris promptly, Owner reserves the right to have debris removed at Contractor's expense.

C. Conduct operations so as not to interfere with adjacent occupied spaces, roads, streets, drives, walks, service lines and the like.

D. Keep all pedestrian areas clear for passage at all times.

3.2 PROTECTION OF STRUCTURES, PROPERTY

A. Execute demolition work to ensure adjacent property no damage from falling debris or other causes.

B. Take precautions to guard against movement, settlement, or be liable for such movement, settlement, or collapse; repair promptly such damage when so ordered.

C. Repair damage to Owner's property or any other person or persons on or off premises by reason of required work.

END OF SECTION

SECTION 031000-CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork for cast-in place concrete.
2. Shoring, bracing, and anchorage.
3. Architectural form liners.
4. Form accessories.
5. Form stripping.

B. Related Sections:
1. Section 032000 - Concrete Reinforcement.
2. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association:
1. AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association:
1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

D. ASTM International:
1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

E. West Coast Lumber Inspection Bureau:
1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum .03 perms when tested in accordance with ASTM E96, Procedure A.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347 ACI 301 ACI 318.

B. For wood products furnished for work of this Section, comply with AF&PA.

C. Perform Work in accordance with State Municipality of Highways Public Work's standard.

1.6 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Form Materials: At discretion of Contractor.

2.2 FORMWORK ACCESSORIES

A. Vapor Retarder: Where indicated on Drawings, 10 mil thick polyethylene sheet manufacture by:
   1. Stego Wrap Class A: by Stego Industries LLC (887) 464-7834
   2. Griffolyn by Reef Industries (800) 231-6074
   3. VaporBlock 10 by Raven Industries (800) 635-3456
   4. Perminator Vapor – May by W.R. Meadows (800) 342-5976
   5. Xtreme by Tex-Trude (281) 452-5961
   6. Or Equivalent

B. Bituminous Joint Filler: ASTM D1751.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

D. Water Stops: Rubber Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

****** OR ******

E. Waterstop: Flexible strip of bentonite waterproofing compound in coil form for joints in concrete construction.
1. Colloid Environmental Technologies Company Model.
2. TC MiraDRi Model.
3. Paramount Technical Products Model.
4. Substitutions: Section 016000 - Product Requirements Not Permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

A. Earth Forms:
1. Earth forms are not permitted.

B. Formwork - General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.

5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Use care in forming and stripping wood forms to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

D. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301 ACI 318.

E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

F. Obtain Architect/Engineer’s approval before framing openings in structural members not indicated on Drawings.

G. Install fillet and chamfer strips on external corners of beams joists columns and.

H. Install void forms in accordance with manufacturer's recommendations.
1. SureVoid Products, Inc., Englewood, CO (800) 458-5444.

I. Do not reuse wood formwork more than times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer’s specifications. Do not coat forms for concrete indicated to receive “scored finish”. Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

G. Form Ties:
1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
2. Place ties at least 1 inch away from finished surface of concrete.
3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

I. Construction Joints:
1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
4. Arrange joints in continuous line straight, true and sharp.

J. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
2. Coordinate work to avoid cutting and patching of concrete after placement.
3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

K. Screeds:

1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

L. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane is not be permitted.

M. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301 ACI 318.

****** OR ******

B. Camber slabs and beams 1/4 inch per 10 feet in accordance with ACI 301 ACI 318.

3.8 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements 017000 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

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SECTION 032000-CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

B. Related Sections:
1. Section 031000 - Concrete Forms and Accessories.
2. Section 033000 - Cast-in-Place Concrete.
3. Section 033500 - Concrete: Reinforcement for concrete floor toppings.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 530.1 - Specifications for Masonry Structures.
4. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
4. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
6. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
7. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
8. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
9. ASTM A775/A775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
10. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

11. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
12. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
13. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars.

C. American Welding Society:
1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.

C. Certificates: Submit AWS qualification certificate for welders employed on the Work.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
1. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice, ACI 301, and ACI 318.

B. Prepare shop drawings in accordance with ACI SP-66.

1.5 QUALIFICATIONS

A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Deformed and Plain Reinforcement: ASTM A615/A615M; 60 ksi yield strength, steel bars, unfinished.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic tipped steel; size and shape to meet Project conditions.

D. Reinforcing Splicing Devices: Mechanical type; full tension and compression; sized to fit joined reinforcing.

E. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice, and ACI 318, on and all applicable codes.

B. Form standard hooks for 180 degree bends, 90 degree bend, stirrup and tie hooks, and seismic hooks as indicated on Drawings.

C. Form reinforcement bends with minimum diameters in accordance with ACI 318 and all applicable codes.

D. Fabricate column reinforcement with offset bends at reinforcement splices.

E. Form spiral column reinforcement from minimum 3/8 inch diameter continuous deformed bar or wire.

F. Form ties and stirrups from the following:
1. For bars No. 10 and Smaller: No. 3 deformed bars.
2. For bars No. 11 and Larger: No. 4 deformed bars.

G. Weld reinforcement in accordance with AWS D1.4.

H. Galvanized Epoxy-Coated Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with CRSI.

I. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

2.4 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Make completed reinforcement available for inspection at manufacturer's factory prior to packaging for shipment. Notify Architect/Engineer at least seven days before inspection is allowed.

C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
1. Do not weld crossing reinforcement bars for assembly.

B. Do not displace or damage vapor retarder.

C. Accommodate placement of formed openings.

D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318 of one bar diameter, but not less than 1 inch.
1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

E. Maintain concrete cover around reinforcement in accordance with ACI 318 applicable code as follows:

Footings and Concrete Formed Against Earth		3 inches
Concrete exposed to earth or weather	No. 6 bars and larger	2 inches
	No. 5 bars and smaller	1-1/2 inches
Supported Slabs, Walls, and Joists	No. 14 bars and larger	1-1/2 inches
	No. 11 bars and smaller	3/4 inches
Beams and Columns		1-1/2 inches

Shell and Folded Plate Members	No. 6 bars and larger	3/4 inches
	No. 5 bars and smaller	1/2 inches

3.2 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

Reinforcement Depth	Depth Tolerance	Concrete Cover Tolerance
Greater than 8 inches	plus or minus 3/8 inch	minus 3/8 inch
Less than 8 inches	plus or minus 1/2 inch	minus 1/2 inch

C. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner’s testing laboratory in accordance with ACI 318 and IBC 2006.

C. Provide free access to Work and cooperate with appointed firm.

D. Reinforcement Inspection:
1. Placement Acceptance: Specified and ACI 318 material requirements and specified placement tolerances.
2. Welding: Inspect welds in accordance with AWS D1.1.
3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
4. Weldability Inspection: Inspect for reinforcement weldability when formed from steel other than ASTM A706/A706M.
5. Continuous Weld Inspection: Inspect reinforcement as required by ACI 318.
6. Periodic Weld Inspection: Other welded connections.

3.4 SCHEDULES

A. Reinforcement For Superstructure Framing Members: Deformed bars, unfinished.

B. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade:Deformed bars and wire fabric, galvanized finish.

C. Reinforcement For Parking Structure Framing Members: Deformed bars, epoxy-coated finish.

END OF SECTION

SECTION 033000-CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
1. Foundation walls.
2. Supported slabs.
3. Slabs on grade.
4. Control, expansion and contraction joint devices.
5. Equipment pads.
6. Light pole base.
7. Flagpole base.

B. Related Sections:
1. Section 031000 - Concrete Forms and Accessories: Formwork and accessories. Placement of joint device joint device anchors in formwork.
2. Section 032000 - Concrete Reinforcement.
3. Section 033500 - Concrete Finishing.
4. Section 033900 - Concrete Curing.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 305 - Hot Weather Concreting.
3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
4. ACI 308.1 - Standard Specification for Curing Concrete.
5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
3. ASTM C33 - Standard Specification for Concrete Aggregates.
4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

10. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
13. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
14. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
15. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
18. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
19. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
21. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
24. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
25. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
26. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
27. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
28. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
29. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
30. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
31. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
32. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
33. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

34. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum .03 perm when tested in accordance with ASTM E96.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on joint devices, attachment accessories, admixtures.

C. Design Data:
1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
a. Hot and cold weather concrete work.
b. Air entrained concrete work.
2. Identify mix ingredients and proportions, including admixtures.

3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 318.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

1.7 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

1.9 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal

B. Normal Weight Aggregates: ASTM C33.
1. Coarse Aggregate Maximum Size: 1.5

C. Water: ACI 318; potable, without deleterious amounts of chloride ions.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Fly Ash: ASTM C618 type C or F.

C. Silica Fume: ASTM C1240.

2.3 ACCESSORIES

A. Vapor Retarder: ASTM E1745 Class A; 10 mil thick; type recommended for below grade application. Furnish joint tape recommended by manufacturer.

B. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler; Asphalt impregnated fiberboard or felt, tongue and groove profile.

****** OR ******

B. Joint Filler: ASTM D1752; Closed cell, resiliency of 95 percent if not compressed more than 50 percent of original thickness.

C. Sealant: ASTM C309, Type I approved by Asphalt and Vinyl composition Tile Institute, 30% minimum solids content.

2.5 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 301 Method 1

B. Provide concrete for the following criteria:

Material and Property	Measurement
Compressive Strength (7 day)	2100 psi
Compressive Strength (28 day)	3000 psi
Cement Type	ASTM C150
Aggregate Size (maximum)	1.5 inch
Air Content	Do not use air entrainment for concrete mixes.
Slump	5 inches

C. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Architect/Engineer.
   1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
   2. Do not use calcium chloride nor admixtures containing calcium chloride.

3. Use set retarding admixtures during hot weather.

D. Site Mixed Concrete: No site mixed concrete is allowed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify testing laboratory and Architect/Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and are not disturbed during concrete placement.

D. Install vapor retarder under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight by adhesive applied between overlapping edges and ends as per manufacturer recommendations.

E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

F. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

G. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor finish.

H. Install joint covers in one piece longest practical length, when adjacent construction activity is complete.

I. Deposit concrete at final position. Prevent segregation of mix.

J. Place concrete in continuous operation for each panel or section determined by predetermined joints.

K. Consolidate concrete.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

P. Screed floors and slabs on grade level, maintaining surface flatness of F_f of 35.

3.4 CONCRETE FINISHING

A. Finish concrete floor surfaces to requirements of Section 03350.

B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for minimum 5 days.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure floor surfaces as specified in Section 03390.

D. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 7 days.

E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI 318

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

E. Concrete Inspections:
1. Continuous Placement Inspection: Inspect for proper installation procedures.
2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

F. Strength Test Samples:
1. Sampling Procedures: ASTM C172.
2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured field cured.
3. Sample concrete and make one set of three cylinders for every 150 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
4. When volume of concrete for any class of concrete would provide less than 3 sets of cylinders, take samples from three randomly selected batches, or from every batch when less than 3 batches are used.
5. Make one additional cylinder during cold weather concreting, and field cure.

G. Field Testing:
1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

H. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39.
2. Test Acceptance: In accordance with ACI 318 .
3. Test one cylinder at 7 days.
4. Test two cylinders at 28 days.
5. Dispose remaining cylinders when testing is not required.

I. Core Compressive Strength Testing:
   1. Sampling and Testing Procedures: ASTM C42/C42M.
   2. Test Acceptance: In accordance with ACI 318.
   3. Drill three cores for each failed strength test from concrete represented by failed strength test.

J. Water Soluble Chloride Ion Concentration Test Method: ASTM C1218; tested at 28 days.
   1. Maximum Concentration: As permitted by applicable code.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections as directed by Architect/Engineer

3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

3.9 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Foundation Walls: 3,000 psi 28 day concrete, form finish with honeycomb filled surface.

B. Underside of Supported Floors and Structure Exposed to View: 4,000 psi 28 day concrete, sack rubbed finish.

C. Exposed Portico Structure: 4,000 psi 28 day concrete, air entrained, smooth stone rubbed finish.

3.10 SCHEDULE - JOINT FILLERS

A. Basement Floor Slab Perimeter:Joint filler Type A set 1/8 inch below floor slab elevation.

B. Exterior Retaining Wall at Loading Dock: Joint filler Type F recessed 3/8 inch with sealant cover.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Labor, materials, services and equipment required in conjunction with or properly incidental to placing of cast-in-place concrete slabs, building members, and MEP equipment pads as described herein or as shown on the Drawings, including but not limited to:
   1. Concrete mix designs.
   2. Assistance with Owner provided laboratory testing of concrete.
   3. Installation of items to be built-in formwork or embedded in concrete but furnished by other trades.
   4. Cast-in-place concrete, with formwork, under slab vapor barrier, reinforcing, accessories, appurtenances, finishing and curing required to complete concrete work.
   5. Grouting under structural steel base plates.

1.2 RELATED REQUIREMENTS

A. Division 1 Sections applicable to the Work of this Section.

1.3 RELATED SECTIONS

A. Section 01115 - Testing and Inspection Laboratory Services

B. Section 02010 - Geotechnical Report

C. Section 02200 - Earthwork

D. Section 02350 - Drilled and Reamed Foundation

E. Section 02520 - Concrete Paving

F. Section 04200 - Unit Masonry

G. Section 05120 - Structural Steel

H. Section 05500 - Miscellaneous Metals

I. Section 07900 - Building sealants

J. Electrical and Mechanical Drawings and Specifications for sleeves, conduit, and other items embedded in concrete.

1.4 QUALITY ASSURANCE

A. Where standards or requirements of this Section are in conflict with those noted on the Contract Drawings, or the Building Code, the more stringent requirements shall govern. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and

discrepancies are clarified and corrected. Failure to do so will not relieve the Contractor from performing the Work correctly at no additional expense to the Owner.

B. Testing Laboratory Services:
1. Test results shall meet or exceed established standards. A technician from the Owner's Testing Laboratory must be present during all operations.

C. Evaluation and Acceptance:
1. Codes and Standards: The Work described in this Section, unless otherwise noted on the Drawings, or herein specified, shall be governed by the editions of the following codes or specifications approved by authorities having jurisdiction.
   a. American Association of State Highway and Transportation Officials (AASHTO)
      1) TP 23, "Proposed Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying"
   b. American Concrete Institute (ACI)
      1) 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"
      2) 301, "Specifications for Structural Concrete for Buildings"
      3) 302, "Guide for Concrete Floor and Slab Construction"
      4) 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"
      5) 305, "Hot Weather Concreting"
      6) 306, "Cold Weather Concreting"
      7) 309, "Standard Practice for Consolidation of Concrete"
      8) 311, "ACI Manual of Concrete Inspection"
      9) 315, "Manual of Standard Practice for Detailing Reinforced Concrete Structures"
      10) 318, "Building Code Requirements for Reinforced Concrete"
      11) 347, "Recommended Practice for Concrete Formwork"
   c. American Society for Testing and Materials (ASTM)
      1) A36, Standard Specification for Carbon Structural Steel
      2) A108, Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
      3) A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
      4) A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
      5) A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
      6) A704, Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
      7) C33, Standard Specification for Concrete Aggregate
      8) C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
      9) C94, Standard Specification for Ready-Mix Concrete
      10) C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates
      11) C150, Standard Specification for Portland Cement
      12) C172, Standard Practice for Sampling Freshly Mixed Concrete
      13) C260, Standard Specification for Air-Entraining Admixtures
      14) C330, Standard Specification for Lightweight Aggregates for Structural Concrete
      15) C494, Standard Specification for Chemical Admixtures for Concrete
      16) C595, Standard Specification for Blended Hydraulic Cements

17) C618, Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
18) C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
19) C979, Standard Specification for Pigments for Integrally Colored Concrete
20) C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)
21) C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete
22) E96, Standard Test Methods for Water Vapor Transmission of Materials
23) E1643, Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs
24) E1745, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
25) F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

d. American Welding Society (AWS)
1) D1.4 Structural Welding Code- Reinforcing Steel

e. Federal Specification (FS)
1) FF-S-325
2) QQ-Z-325C

D. Source Quality Control:
1. Concrete production facilities shall meet the requirement for certification by the National Ready Mixed Concrete Association. All ready mix concrete trucks proposed for use on the project shall meet the requirements of NRMCA, Certification of Ready Mix Concrete Production Facilities.
2. Concrete batchers shall be completely interlocked semi-automatic or automatic batchers, as defined by the Concrete Plant Manufacturers Bureau.
3. Concrete batchers shall have graphic, digital, or photographic recorders, which shall register both empty balance and total weight (or volume of water or admixture) of each batched material, time to the nearest minute, date, identification of batch, and numerical count of each batch. Copies of the record shall be furnished to the Inspection and Testing Laboratory.
4. The Inspection and Testing Laboratory shall provide concrete batch plant inspection as follows:
a. Provide a qualified inspector with necessary equipment and apparatus to inspect weighing and batching of controlled concrete at batch plant on a random basis, approximately once daily as the concrete is being placed on this project.
b. Make certain that materials and batch equipment used are in accordance with requirements of Specifications.
c. Check for adjustment in batch weights to compensate for variations in moisture content.
d. Submit promptly to Architect, certification of weights used in loads of acceptable concrete which has been batched during plant inspection time.

E. Concrete Mix Design Criteria:
1. Design concrete mixes in accordance with ACI 318, Section 5.3, Proportioning on the basis of field experience and/or trial mixtures.
2. Submit the proposed mix designs for each concrete mix type proposed.
3. Determination of required average strength above specified strength shall be in accordance with ACI 318.

4. If trial mixes are used as the basis for the proposed mix design, mold and cure test cylinders in accordance with ASTM C39. Do not place concrete on project until laboratory reports and results of confirmation cylinder tests have been evaluated by the Inspection and Testing Laboratory and results indicate that proposed mixes will develop required strengths.
5. Inspection and Testing Laboratory shall furnish the Architect with a written evaluation of each proposed concrete mix design submitted by the Contractor.
6. Check mix designs and revise if necessary wherever changes are made in aggregates or in surface water content of aggregate or workability of concrete. Water content shall be minimum to produce workable mix. The water content shall be verified in the field by use of the Microwave Test.

1.5 SUBMITTALS

A. Mix Designs: Submit proposed mix designs, including confirmation cylinder test results, in accordance with ACI 318, Section 5.3, Proportioning on the basis of field experience and/or trial mixtures, on the Mix Design Submittal Form included at the end of this specification. They shall be submittal to the Architect/Engineer and Inspection and Testing Laboratory for evaluation a minimum of 14 days prior to placing concrete. Key requirements:
   1. Combined aggregate gradation**.**
   2. Proportions of cement, including fly ash content, fine and coarse aggregates, and water.
   3. Type, color and dosage of integral coloring compounds, where applicable.
   4. Range of ambient temperature and humidity for which design is valid.
   5. Any special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product.

B. Complete test data for trial mixes or a complete summary of previous project test results for mix design based on standard deviation analysis must be included.

C. Provide duplicate delivery tickets for each load of ready-mix concrete delivered to site, in accordance with ASTM C94. Show batch weights on each ticket.

C. Provide mill test reports on an as-used basis for each type and brand of cementitious material used, including fly ash.

D. Provide certification from independent test laboratory indicating underslab vapor retarder compliance with specification and ASTM 1745 Class A requirements.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Mix and deliver concrete to project ready-mixed in accordance with ASTM C94. Mix concrete a minimum of 70 revolutions of transit mix drum at mixing speed. A minimum of 40 revolutions shall be at the production plant.

B. Schedule delivery so that continuity of any pour will not be interrupted for over 15 minutes.

C. Place concrete on site within 90 minutes after proportioning materials at batch plant.

1.7 JOB CONDITIONS

A. Hot Weather Concreting:
   1. Follow ACI 301 and ACI 305.
   2. Provide water-reducing retarding admixture conforming to ASTM C494, Type D when necessary to retard initial set. The admixture shall be dispensed in accordance with manufacturer's recommendations.

3. Maximum concrete temperature shall not exceed 95 degrees F at time of placement.
   a. Concrete with temperatures above 90 degrees F shall be placed only if a high range water reducer (superplasticizer) is added to the mix as directed by the Testing Laboratory to maintain the specified slump during placement.

B. Cold Weather Concreting: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures.
   1. Follow ACI 301 and ACI 306.
   2. When ambient temperature at site is below 40 degrees F or is expected to fall to that temperature within ensuing 24 hours, heat water and/or aggregate prior to adding to mix so that temperature of concrete will be between 55 degrees F and 85 degrees F at time of placement.
   3. Maintain temperature of deposited concrete between 50 degrees F and 70 degrees F for minimum of seven (7) days after placing.
   4. Add the specified non-corrosive accelerator for all floor concrete placed at air temperatures below 50 degrees F.

C. Temperature Changes: Maintain changes in concrete temperature as uniformly as possible, but in no case exceed change of 5 degrees F per hour or 25 degrees F in any 24 hour period.

D. Combustion heaters shall not be used during the first 48 hours without precautions to prevent exposure of concrete and workmen to exhaust gasses containing carbon dioxide and/or carbon monoxide.

E. Admixtures intended to accelerate hardening of concrete or produce higher than normal strength at early periods will not be permitted unless approved by the Architect. The use of calcium chloride is specifically prohibited.

1.8 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01110 - Notification of Architect Requirements.

1.9 SEQUENCING/SCHEDULING

A. Coordinate Work of this Section with work of other Sections as required to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers named within this Section are approved for use on the Project for the product for which they are specified. Other manufacturers must have a minimum of five (5) years experience manufacturing the product specified and meet or exceed the specifications for that product. Substitution of products must be in accordance with the General Conditions, Supplementary Conditions, and Section 01300, Submittals to be considered prior to proposal.

2.2 MATERIALS

A. Formwork:
   1. General: Contractor may use any of the following formwork materials as long as material meets the following and will not stain, or impart any undesirable texture, i.e. wood grain, where such texture would be objectionable in an exposed location.
      a. Wood Forms:

1) Plywood: PS 1, Douglas Fir or Spruce species.
2) Medium Density Overlay (MDO): One (1) side grade; sound undamaged sheets with clean, true edges.
3) Lumber: Southern Yellow Pine species; No. 2 grade, with grade stamp clearly visible.

b. Pre-Fabricated Forms:
1) Preformed Steel Forms: Minimum 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
2) Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

c. Form Liner: Any material recommended by manufacturer to impart finish which will exhibit the finish or design characteristics, i.e. smooth, textured, ribbed, etc. detailed by the Architect for exposed locations as shown or required and capable of being stripped from complex designs without damaging the finish or design. Form liner shall be as manufactured by Symons Corporation, Greenstreak, Inc. or Architect approved equal.

B. Metal Reinforcement:
1. Bars:
a. General: Conform to ACI 315, latest edition.
b. Comply with ASTM A615, Grade 60.
c. Number 3 bars comply with ASTM A615, Grade 40
2. Welded Steel Wire Fabric (Mesh): [Strictly prohibited]
a. Conform to ASTM A185
b. Shall be type which is fabricated and delivered to jobsite in flat sheets. Rolls of mesh will not be acceptable.

C. Concrete, General:
1. Ready-mixed concrete, ASTM C94
2. Comply with ACI 318.
3. Concrete must be approved by Architect through design mix and cylinder test of testing laboratory.
4. Unless approved otherwise by the Architect, use one (1) brand of cement throughout the work where finished surface will be exposed to view.
5. Strength: Refer to Paragraph 2.3, A.

D. Concrete Materials:
1. Cement/Fly Ash:
a. Portland Cement, Type I or III, conforming to the requirements of ASTM C150.
b. Fly Ash, Class C or F, conforming to the requirements of ASTM C618. The use of Fly Ash shall be subject to review by the Architect. Where Fly Ash is used in the mix design, Fly Ash shall comprise no more than 20 percent by weight of the total cementitious material in the mix.
c. Combined aggregate gradation for slabs and other designated concrete shall be 8 percent - 18 percent for large top size aggregates (1-1/2 in.) or 8 percent - 22 percent for smaller top size aggregates (1 in. or 3/4 in.) retained on each sieve below the top size and above the No. 100.

E. Aggregate:
1. Fine Aggregate: ASTM C33; clean, hard, durable, uncoated, natural and manufactured sand, free of silt, loam or clay.

2. Coarse Aggregate: ASTM C33; hard, durable, uncoated, crushed stone; gradation in accordance with Size No. 467 for piers and concrete footings and Size No. 67 for all other concrete. Maximum aggregate size in accordance with ACI 318.
3. Grading shall be in accordance with "Standard Method for Fine Analysis of Sieve and Coarse Aggregates" (ASTM C136).

F. Water: ASTM C94, Paragraph 4.1.3; potable, clean and free from oil, acid and injurious amount of vegetable matter, alkalies, and other impurities.

G. Admixtures:
1. Cement-dispersing, water-reducing types. Admixtures shall conform to ASTM C494, Type A or D, and shall be used strictly in accordance with manufacturer's recommendations and as determined by the Inspection and Testing Laboratory. Admixture shall not discolor concrete or in any way affect the appearance of the concrete.
   a. High-range water reducing admixture conforming to ASTM C494, Type F or G shall be used as required and shall be one (1) of the following or Architect approved equal:
      1) Eucon 37 (Type F), Eucon 537 (Type G) by The Euclid Chemical Company
      2) Rheobuild 1000 (Type F), Rheobuild 716 (Type G) by Master Builders
      3) Sikament 300 (Type F), Sikament 86 (Type G) by Sika Chemical Corp.
      4) WRDA-19 (Type F), Daracem 100 (Type G) by W.R. Grace
2. An air-entraining admixture conforming to ASTM C260 shall be used as required on the Drawings and shall be one (1) of the following or Architect approved equal:
   a. Air-Mix or AEA-92 by The Euclid Chemical Company
   b. Sika Aer by Sika Corporation
   c. MB-VR or MB-AE by Master Builders
3. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
4. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of admixtures will be required from the admixture manufacturer prior to mix design review by the Architect/Engineer.

H. Non-Shrink Cement Grout:
1. The non-shrink grout shall be a factory pre-mixed grout and shall conform to ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 4 foot x 4 foot base plate. Provide one (1) of the following or Architect approved equal:
   a. NS Grout by The Euclid Chemical Company
   b. Five Star Grout by U.S. Grout Corp.
   c. Horn Non-Corrosive Non-Shrink Grout by Tamms Industries
   d. Duragrout by L & M Construction Chemicals, Inc.
   e. Masterflow 713 by Master Builders
   f. SikaGrout 212 by Sika Corp.
   g. Sonogrout 10K by Sonneborn
   h. 588 Grout by W. R. Meadows, Inc.
2. High Flow Grout: Where high fluidity and/or increased placing time is required, use high flow grout. The factory pre-mixed grout shall conform to ASTM C1107, "Standard Specification for Packages Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 18 inch x 36 inch base plate. Provide one (1) of the following or Architect approved equal:

a. Hi-Flow Grout by The Euclid Chemical Company
b. Crystex by L & M Construction Chemicals, Inc.
c. Masterflow 928 by Master Builders
d. CG-86 Grout by W. R. Meadows, Inc.

I. Non-Oxidizing Metallic Hardener: (For use at Loading Dock where shown)
1. Non-Oxidizing Metallic Floor Hardener: The specified non-oxidizing metallic floor hardener shall be formulated, processed and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a mixture of specially processed non-rusting aggregate, selected portland cement and necessary plasticizing agents. Product shall be Diamond-Plate by The Euclid Chemical Company or Architect approved equal.

J. Evaporation Retardant:
1. Evaporation Retardant shall be a thin, continuous film which prevents rapid moisture loss from the concrete surface. For use when concrete operations must be performed in direct sun, wind, high temperatures, or for relative humidity. Products: Subject to compliance with requirements, provide one (1) of the following or Architect approved equal:
a. Eucobar by The Euclid Chemical Company
b. Confilm by Master Builders
c. Evapre by W. R. Meadows, Inc.

K Liquid Densifier/Sealer:
1. The liquid densifier compound shall be a siliconate based sealer which penetrates concrete surfaces, increases abrasion resistance and provides a "low-sheen" surface that is easy to clean and eases the problem of tire mark removal. Provide Euco Diamond Hard by The Euclid Chemical Company or equal by Master Builders, Sika Corp., Sonneborn, or Architect approved equal.

L. Curing Compound: Shall be dissipating resin type, which chemically breaks down after approximately eight (8) weeks. Membrane forming compound shall meet ASTM C309, Types 1 and 1D Class B, water based, VOC/AIM Compliant. Provide Kurez DR VOX by The Euclid Chemical Company, or equal by Master Builders, Sika Corp., Sonneborn, 1100 Clear by W. R. Meadows, Inc., or Architect approved equal.

M. Curing and Sealing Compound: Shall be a high solids acrylic copolymer emulsion blend. Membrane forming compound shall meet ASTM C1315, Type 1 Class B. Provide Super Rez-Seal by The Euclid Chemical Company or equal by Master Builders, Sika Corp., Sonneborn, VOCOMP 25 1315 by W. R. Meadows, Inc., or Architect approved equal.

N. Miscellaneous Structural Metals Associated with Structural Concrete:
1. Structural steel pieces, including miscellaneous structural metals placed in concrete, exposed to weather, in permanent contact with soil, or accessible to salt intrusion shall be hot dipped galvanized in accordance with ASTM A123.
2. Structural steel pieces embedded in concrete shall conform to ASTM A36, unless noted otherwise on the Drawings.
3. Welding of inserts, anchors and other steel pieces used in conjunction with structural concrete shall conform to AWS Dl.4.
4. Welding of reinforcing steel used in conjunction with structural concrete shall conform to AWS Dl.4.
5. Headed stud anchors shall conform to ASTM A108, minimum tensile strength 60,000 PSI.
6. Concrete expansion anchors shall be wedge-type anchors, meeting the requirements of FS FF-S-325, Group 11, Type 4, Class 1, plated in accordance with FS QQ-Z-325C, Type

11, Class 3. Size and location shall be as indicated on the Drawings. Products shall be by Hilti Corp., Powers Fasteners, Inc. or Architect approved equal.

O. Miscellaneous Materials and Accessories:

1. Form ties: Adjustable length and type which will not leave holes larger than 1 inch in diameter in face of concrete. Ties shall be such that when forms are removed, no metal will be within 1 inch of the finished concrete surface. The holes must be patched.
2. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages, Fasteners: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
3. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.
4. Chairs and Spacers: Heavy-duty plastic-type sized to support all reinforcing steel to proper height. Use type with sand cushion pads where concrete is on grade. Provide chairs and spacers Series "B" by W.H.C. Products, Inc., E-Z Chair by Aztec Concrete Accessories, Inc., GTI Bar Chair by General Technologies, Inc., or Architect approved equal.
5. Under-Slab Vapor Retarder (Barrier) Membrane:
   a. Comply with ASTM E1745, Class A or better, with a maximum water vapor permeance of 0.036 perms when tested in accordance with ASTM E96, and 10 mils or more in thickness in accordance with ACI 302. Provide compatible seam taping and pipe boots or sealing mastic in accordance with manufacturer's requirements. Provide proof of compliance to Architect at time of delivery of materials. Except as noted below, provide one (1) of the following or Architect approved equal:
      1) Barrier Bac-Inc
      2) W. R. Meadows, Inc.
      3) Reef Industries, Inc.
      4) Raven Industries, Inc.
      5) Stego Industries, LLC
      6) Fortifiber Building Products
   b. Under Gymnasiums, Auditorium, and Areas Below Finish Floor Level: Premoulded Membrane Vapor Seal with Plasmatic Core manufactured by W.R. Meadows, Inc., Hempshire, IL; or Architect approved equal.
6. Waterstops:
   a. Ribbed flat 3/16 inch by six (6) inch with 1/8 inch ribs, rated for 75 foot of head pressure. Provide factory made corner fittings weld splices with thermostatically controlled heating iron. Style No. 782 by Greenstreak, Inc., or Architect approved equal.
   b. Contractor's Material Option: Specially formulated preformed joint sealant that provides a lasting,, watertight bond to both fresh and cured concrete surfaces. Synko-Flex Preformed Plastic Adhesive Waterstop and Synko-Flex Primer manufactured by Synko-Flex Products, Division of Henry Company, Houston, Texas; (713) 671-9502 or Architect approved equal.
7. Carton Void Forms: If shown or required, shall be wax impregnated cardboard trapezoidal shape, with 1/8 inch thick tempered hardboard for top plane when requested by Architect.
8. Corners: Chamfer, wood strip type; one (1) inch x one (1) inch size; maximum possible lengths.
9. Dovetail Anchor Slot: Galvanized steel, 22 gauge thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
10. Flashing Reglets: Galvanized steel, 22 gauge thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

11. Bonding Agent: Acrylic latex emulsion type as recommended for bonding new concrete to old concrete.
12. Epoxy Adhesive: ASTM C881, two (2) component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. Provide one (1) of the following or Architect approved equal:
    a. Euco #452 Epoxy System or Euco #620 Epoxy System by The Euclid Chemical Company
    b. Sikadur Hi-Mod by Sika Corp.
    c. Rezi-Weld 1000 by W. R. Meadows, Inc.
13. Integral Color Pigment (If shown or required): Mineral oxide, lightfast, lime-proof, water-resistant type conforming to ASTM C979. Color(s) shall be as selected by Architect from manufacturer's standard color line. Provide one (1) of the following or Architect approved equal:
    a. ChemSystems, Inc.
    b. Davis Colors
    c. New Riverside Ochre Co., Inc.
    d. L.M. Scofield Company
14. Color Stain (If shown or required): A chemically reactive stain, designed for adding variegated color to new or old concrete. Color(s) shall be as selected by Architect from manufacturer's standard color line. Provide Lithochrome Chemstain by L.M. Scofield Company or Architect approved equal.
15. Joint Sealants: Refer to Section 07900, Building Sealants

2.3 CONCRETE MIXES

A. Strength: Concrete is classified and specified by ultimate compressive strength (f c) at the age of 28 days. Unless indicated otherwise on the Drawings, strengths shall be as follows:
    1. All concrete including grade beams, footings, slabs, and pads: 5 sack/3,000 psi/28 days.
    2. Strength recommendations on Structural Drawings supersede when they are greater than specified here.

B. Interior slabs subjected to vehicular traffic: This concrete shall have a maximum W/cm of 0.48 and maximum air content of 3 percent. No air-entraining admixture shall be added to this mix.

C. Concrete permanently exposed to freezing and thawing shall contain an air-entraining admixture to produce 4.5 percent - 7.5 percent of air by volume of concrete.

D. Proportions: Proportions of cement, aggregate, admixture and water to attain required plasticity and compressive strength shall be in accordance with ACI 318, Section 5.3, Proportioning on the basis of field experience and/or trial mixtures. Do not make changes in proportions without submitting proposed changes to Inspection and Testing Laboratory for evaluation.
    1. Trial mixtures having proportions and consistencies suitable for the work shall be made based on ACI 211. 1, using at least three (3) different water-cement ratios which will produce a range of strengths encompassing those required for this project.
    2. Trial mixes shall be designed to produce a slump within 3/4 inch of the maximum permitted, and for air-entrained concrete, within 0.5 percent of maximum allowable air content. The temperature of concrete used in trial batches shall not exceed the maximum temperature specified.
    3. For each water-cement ratio, at least three confirmation compression test cylinders for each test age shall be made and cured in accordance with ASTM C192. Confirmation cylinders shall be tested at seven (7) and 28 days in accordance with ASTM C39.

4. From the results of the 28 day confirmation tests, a curve shall be plotted showing the relationship between the water-cement ratio and compressive strengths. From this curve, the water-cement ratio to be used in the concrete shall be selected to produce the average strength required.
5. The cement content and mixture proportions to be used shall be such that this water-cement ratio is not exceeded when slump is the maximum permitted. Control in the field shall be based upon maintenance of proper cement, water content, slump and air content.
6. Mix designs furnished by the concrete supplier, shall be based on the standard deviation analysis of previous test records meeting the requirements of Section 5.3.1 - Standard deviation of ACI 318. These mixes will be accepted in lieu of trial mixtures described in paragraphs above.
   a. Temperature of concrete in test data shall be within 5 degrees F of maximum temperature specified for this project.
   b. Strengths indicated in test data shall be in accordance with ACI 318, Section 5.3.
   c. The specified strength of concrete used in supporting test data shall vary no more than 500 PSI plus or minus from that specified for this project.
   d. The Testing Laboratory shall keep a strength and standard deviation record of all concrete for the duration of the project as specified in this section.

PART 3 - EXECUTION

3.1 GENERAL

A. Inserts: Give the various trades and subcontractors ample notification and opportunity to furnish all anchors, nailers, pipes, conduits, boxes, inserts, thimbles, sleeves, frame vents, wires, supports, or other items required to be built into the concrete by the provisions of the Drawings or of the Specification governing the work of such trades and subcontractors, or as it may be necessary for the proper execution of their work. Obtain suitable templates or instructions for the installation of such items which are required to be placed in the forms.

B. Install under-slab vapor retarder as instructed by manufacturer in accordance with ASTM E1643. Penetrations shall be sealed to maintain integrity of barrier. Tape around all openings and seal all penetrations as instructed by the barrier manufacturer. Grade stakes shall not be driven through the vapor barrier. Avoid punctures during reinforcement and concrete placement.

C. Slump:
1. Concrete not containing a high range water reducing admixture shall not be placed when its plasticity, as measured by slump test, is outside the following limits:
   a. Footings: 6 inches maximum, 4 inches minimum
   b. All other Structural Concrete: 5 inches maximum, 3 inches minimum
   c. Pavement: 4 inches maximum. Coordinate slump with requirements in Section 02520, Concrete Paving.
   d. Slump drop not to exceed 2 inches when pumped.
2. Concrete containing a high range water reducing admixture shall not be placed when its plasticity, as measured by slump test, is outside the following limits:
   a. Prior to addition high range water reducer: 3 inches maximum, 2 inches minimum.
   b. After addition of high range water reducer: 9 inches maximum.

D. Classes of Concrete and Usage: Concrete of the several classes of concrete required shall have the characteristics shown on the Drawings.

E. Mixing:

1. Transit-mixed concrete conforming to the requirements of ASTM C94 and ACI 304 shall be used in lieu of concrete mixed at the job site. Concrete shall not be transported or used in any case after a period in excess of 90 minutes has elapsed after the introduction of water into the mixer.
2. Indiscriminate addition of water to increase slump of concrete is prohibited. Add water only at the direction of the Testing Laboratory. No water shall be added which increases the water cement ratio of the concrete in excess of the water cement ratio indicated on the approved mix design. At the direction of the Inspection and Testing Laboratory the addition of a high range water reducing admixture may be used to retemper concrete.
3. The agency supplying transit-mixed concrete shall have a plant of sufficient capacity and adequate transportation facilities, to assure continuous delivery at the rate required. The frequency of deliveries to the site of the work must be such as to provide for placing the concrete continuously throughout any one (1) pour.

F. Conveying Concrete: Convey concrete from the mixer to the place of final deposit by methods which will prevent the separation or loss of the ingredients. Concrete to be conveyed by pumping shall be submitted to the Inspection and Testing Laboratory for evaluation for each class of concrete specified before being used. Test cylinders for pumped concrete shall be taken at the discharge end of the pumping equipment.

G. Equipment for chuting, pumping, and pneumatically conveying concrete shall be of such size and design as to assure a practically continuous flow of concrete at the delivery end without separation of the materials. The use of gravity-flow or aluminum chutes or conveyors for transporting concrete horizontally will not be permitted.

H. Miscellaneous Materials and Accessories: if not specifically noted, install all materials and accessories per manufacturer's instructions as if noted here in full.

I. Extend underslab vapor barrier continuously under entire slab, slab turn downs, vertical face of grade beams and footings to completely protect concrete adjacent to earth. Overlap joints and install seam tape and pipe boots, and seal penetrations as instructed by manufacturer.

3.2 CONCRETE CONTROL AND TESTING

A. Inspection and Testing laboratory services shall be in accordance with Section 01115, Inspection and Testing Laboratory Services.

B. Except as noted below, all inspection and testing related to concrete placement, including reinforcing and embedded items, shall be the responsibility of the Owner. The Owner will directly engage the services of a qualified Testing and Inspection Laboratory, however, the Contractor shall provide access to the Owner's consultant, and, if required, the Contractor shall provide patching and repairing of surfaces removed to facilitate testing and inspection.

C. Should the strength of concrete fall below the minimum, then additional tests, including load tests, may be required. These tests, if required, shall be made at the Contractor's expense and shall be in accordance with ASTM C42 and ACI 318. If tests do not meet the applicable requirements, then the structure, or any part of the structure, shall be removed and replaced at the Contractor's expense.

D. Any concrete testing requested by the Contractor for early formwork or shoring removal, etc., shall be at the Contractor's expense.

E. Do not permit placement of concrete having a measured slump outside limits given on Drawings or Specifications, except when approved by Architect/Engineer.

3.3 PLACING CONCRETE

A. Place concrete in reasonably uniform layers, approximately horizontal, and not more than 18 inches deep, exercising care to avoid vertical joints or inclined planes. The piling up of concrete in the forms in such a manner as to cause the separation or loss of any of its ingredients will not be permitted. Concrete which has partially set or hardened shall not, under any circumstances, be deposited in the work.

B. Place concrete in the forms as nearly in its final position as is practical to avoid rehandling. Exercise special care to prevent splashing the forms or reinforcement with concrete. Remove any hardened or partially hardened concrete which has accumulated on the forms or reinforcement before the work proceeds. Do not place concrete on previously deposited concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the respective member of section, except as hereinafter specified.

C. Do not permit concrete to drop freely any distance greater than five (5) feet. Where longer drops are necessary, use a chute, tremie, or other acceptable conveyance to assist the concrete into place without separation. Do not pour directly into any excavations where water is standing.

D. Vibration: As soon as concrete is deposited, thoroughly agitate same by means of mechanical vibrators and suitable hand tools, so manipulated as to work the mixture well into all parts and corners of the forms, and entirely around the reinforcement and inserts. Mechanical vibrators shall maintain frequencies in accordance with the recommendations of ACI 309. Table 5.1.4, and shall be operated by competent workmen. Over vibrating and use of vibrators to transport concrete within forms shall not be allowed. A spare vibrator shall be kept on the job site during all concrete placing operations.

E. Bonding: Before depositing any new concrete on or against previously deposited concrete which has partially or entirely set, the surface of the latter shall be thoroughly roughened and cleaned of all foreign matter, scum and laitance. The specified or an Architect approved bonding agent or epoxy adhesive shall be used.

F. Construction Joints: Except as otherwise specifically indicated on the Drawings, each concrete member shall be considered as a single unit of operation, and all concrete for the same shall be placed continuously in order that such unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, same shall be located at or near the midpoints of spans. Additional construction joints shall not be made under any circumstances without prior review by the Architect.

G. Protect all freshly placed concrete from washing by rain, flowing water, etc. Do not allow the concrete to dry out from the time it is deposited in the forms until the expiration of the curing period.

H. Imperfect or damaged work, or any material damaged or determined to be defective before final completion and acceptance of the entire job, shall be satisfactorily replaced at the Contractor's expense and shall be in conformity with all of the requirements of the Contract Documents. Removal and replacement of concrete work shall be done in such a manner as not to impair the appearance or strength of the structure in any way.

I. Cleaning: Upon completion of the work, all forms, equipment, protective coverings and any rubbish resulting therefrom shall be removed from the premises. Finished concrete surfaces shall be left in clean and perfect condition, satisfactory to the Owner. Sweep with an ordinary broom and remove all mortar, concrete droppings, loose dirt, mud, etc.

3.4 FLOOR AND SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
   1. After placing slabs, surface shall be leveled to an F_F 15 - F_L 13 tolerance. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, or sand-bed terrazzo, and as otherwise indicated.
   1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Surface shall achieve an F_F 20 - F_L 17 tolerance.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
   1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final troweling operation, free of trowel marks, uniform in texture and appearance and to a F_F35/ F_L30 tolerance (F_L17 for elevated slabs). Grind smooth surface defects, which would telegraph through applied floor covering system.

D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application. A sample panel is required.

E. Liquid Densifier/Sealer: Apply liquid densifier/sealer on exposed interior floors subject to vehicular abrasion and as indicated on the Drawings. Compound shall be mechanically scrubbed into the surface in strict accordance with the directions of the manufacturer and just prior to completion of construction.

F. Non-Oxidizing Metallic Floor Hardener: All slabs, in the loading dock area, or other areas noted on the Drawings, shall receive an application of the non-oxidizing, metallic floor hardener applied in accordance with manufacturer's instructions to produce a smooth dense finish.

3.5 NON-SHRINK GROUT

A. Refer to Structural Drawings for column base plates and other structural grouting requirements.

B. Non-shrink grout shall be mixed only in such quantities as are needed for immediate use. No retempering shall be permitted and materials which have been mixed for a period exceeding 30 minutes shall in no case be used upon any portion of the work.

C. Where high fluidity and/or increased placing time is required use the specified high flow grout. This grout shall be used for all base plates larger than ten (10) square feet.

D. For every 1/3 cubic yards of grout placed, grout strength shall be tested with a set of cubes as follows:
   1. A set of cubes shall consist of three cubes to be tested seven (7) days, and three (3) cubes to be tested at 28 days.
   2. Test cubes shall be made and tested in accordance with ASTM C1107, Section 12.5, with the exception that the grout should be restrained from expansion by a top plate.

3.6 CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. All concrete shall be kept continuously moist and above 50 degrees F for seven days. When high early strength concrete is used this temperature requirement may be lowered to three (3) days.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
   1. Provide specified curing compound to exposed interior slabs. This curing compound must be dissipating or easily removed in the cleaning process prior to the application of any liquid densifier/ sealer.

3.7 DEFECTIVE WORK

A. Imperfect or damaged work, or any material damaged or determined to be defective before final completion and acceptance of the entire job, shall be satisfactorily replaced at the Contractor's expense and shall be in conformity with all of the requirements of the Contract Documents. Removal and replacement of concrete work shall be done in such a manner as not to impair the appearance or strength of the structure in any way.

3.8 CLEANING

A. Upon completion of the work, all forms, equipment, protective coverings and any rubbish resulting therefrom, shall be removed from the premises. Finished concrete surfaces shall be left in clean and perfect condition, satisfactory to the Owner. Sweep with an ordinary broom and remove all mortar, concrete droppings, loose dirt, mud, etc.

3.9 REPAIR OF DEFECTIVE AREAS

A. With prior approval of the Architect/Engineer, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Section 5.3.7, using the polymer repair mortars and/or epoxy adhesives furnished by The Euclid Chemical Company, Sika Chemical Corp., or Architect approved equal.

3.10 FIELD QUALITY CONTROL AND TESTING

A. Inspection and Testing Laboratory services shall be in accordance with Section 01115, Inspection and Testing Laboratory Services.

END OF SECTION

SECTION 03 31 00

CONCRETE ACCESSORIES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Labor, materials, services and equipment required in conjunction with or properly incidental to placing of cast-in-place concrete slabs, building members, and MEP equipment pads as described herein and/or as shown on the Drawings, including but not limited to:
   1. Concrete accessories not included in structural Section 03300.

1.2 RELATED REQUIREMENTS

A. Division 1 Sections applicable to the Work of this Section.

1.3 RELATED SECTIONS

A. Section 03300 - Cast-in-place Concrete

B. Section 07271 - Vapor and Air Barriers

1.4 QUALITY ASSURANCE

A. Where standards or requirements of this Section are in conflict with those noted on the Contract Drawings, or the Building Code, the more stringent requirements shall govern. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and discrepancies are clarified and corrected. Failure to do so will not relieve the Contractor from performing the Work correctly at no additional expense to the Owner.

B. Evaluation and Acceptance:
   1. Codes and Standards: The Work described in this Section, unless otherwise noted on the Drawings, or herein specified, shall be governed by the editions of the following codes or specifications approved by authorities having jurisdiction.
      a. American Concrete Institute (ACI)
      b. American Society for Testing and Materials (ASTM)
         1) A36, Standard Specification for Carbon Structural Steel
         2) A108, Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
         3) A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
         4) C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
         5) C979, Standard Specification for Pigments for Integrally Colored Concrete
         6) E96, Standard Test Methods for Water Vapor Transmission of Materials
         7) E1643, Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs
         8) E1745, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

1.5 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer's installation instructions.

1.6 SEQUENCING/SCHEDULING

A. Coordinate Work of this Section with work of other Sections as required to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers named within this Section are approved for use on the Project for the product for which they are specified. Other manufacturers must have a minimum of five (5) years experience manufacturing the product specified and meet or exceed the specifications for that product. Substitution of products must be in accordance with the General Conditions, Supplementary Conditions, and Section 01300, Submittals to be considered prior to proposal.

2.2 MATERIALS

A. Evaporation Retardant (where applicable):
1. Evaporation Retardant shall be a thin, continuous film which prevents rapid moisture loss from the concrete surface. For use when concrete operations must be performed in direct sun, wind, high temperatures, or for relative humidity. Products: Subject to compliance with requirements, provide one (1) of the following or Architect approved equal:
a. Eucobar by The Euclid Chemical Company
b. Confilm by Master Builders
c. Evapre by W. R. Meadows, Inc.

B. Liquid Densifier/Sealer (where applicable):
1. Siliconate based sealer which penetrates concrete surfaces, increases abrasion resistance and provides a “low-sheen” surface that is easy to clean and eases the problem of tire mark removal. Provide Euco Diamond Hard by The Euclid Chemical Company or equal by Master Builders, Sika Corp., Sonneborn, or Architect approved equal.

C. Curing Compound: See Section 03300, Cast-in-Place Concrete.

D. Miscellaneous Structural Metals Associated with Structural Concrete (unless indicated otherwise):
1. All structural steel pieces, including miscellaneous structural metals placed in concrete, exposed to weather, in permanent contact with soil, or accessible to salt intrusion shall be hot dipped galvanized in accordance with ASTM A123.
2. All structural steel pieces embedded in concrete shall conform to ASTM A36, unless noted otherwise.
3. Welding of reinforcing steel used in conjunction with structural concrete shall conform to AWS Dl.4.
4. Headed stud anchors shall conform to ASTM A108, minimum tensile strength 60,000 PSI.
5. Concrete expansion anchors shall be wedge-type anchors, meeting the requirements of FS FF-S-325, Group 11, Type 4, Class 1, plated in accordance with FS QQ-Z-325C, Type 11, Class 3. Size and location shall be as indicated on the Drawings. Products shall be by Hilti Corp., Powers Fasteners, Inc. or Architect approved equal.

E. Miscellaneous Materials and Accessories:
1. Under-Slab Vapor Retarder (Barrier) Membrane: Refer to Section 07271 - Vapor and Air Barriers
2. Waterstops:
a. Ribbed flat 3/16 inch by six (6) inch with 1/8 inch ribs, rated for 75 foot of head pressure. Provide factory made corner fittings weld splices with thermostatically controlled heating iron. Style No. 782 by Greenstreak, Inc., or Architect approved equal.
b. Contractor's Material Option: Specially formulated preformed joint sealant that provides a lasting,, watertight bond to both fresh and cured concrete surfaces. Synko-Flex Preformed Plastic Adhesive Waterstop and Synko-Flex Primer manufactured by Synko-Flex Products, Division of Henry Company, Houston, Texas; (713) 671-9502 or Architect approved equal.
3. Corners: Chamfer, wood strip type; one (1) inch x one (1) inch size; maximum possible lengths.
4. Flashing Reglets: Galvanized steel, 22 gauge thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
5. Epoxy Adhesive: ASTM C881, two (2) component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. Provide one (1) of the following or Architect approved equal:
a. Euco #452 Epoxy System or Euco #620 Epoxy System by The Euclid Chemical Company
b. Sikadur Hi-Mod by Sika Corp.
c. Rezi-Weld 1000 by W. R. Meadows, Inc.
6. Integral Color Pigment (If shown or required): Mineral oxide, lightfast, lime-proof, water-resistant type conforming to ASTM C979. Color(s) shall be as selected by Architect from manufacturer's standard color line. Provide one (1) of the following or Architect approved equal:
a. ChemSystems, Inc.
b. Davis Colors
c. New Riverside Ochre Co., Inc.
d. L.M. Scofield Company
7. Color Stain (If shown or required): A chemically reactive stain, designed for adding variegated color to new or old concrete. Color(s) shall be as selected by Architect from manufacturer's standard color line. Provide Lithochrome Chemstain by L.M. Scofield Company or Architect approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Install under-slab vapor retarder as instructed my manufacturer in accordance with ASTM E1643. Penetrations shall be sealed to maintain integrity of barrier. Tape around all openings and seal all penetrations as instructed by the barrier manufacturer. Grade stakes shall not be driven through the vapor barrier. Avoid punctures during reinforcement and concrete placement.

B. Miscellaneous Materials and Accessories: if not specifically noted, install all materials and accessories per manufacturer's instructions as if noted here in full.

C. Extend underslab vapor retarder continuously under entire slab, slab turn downs, vertical face of grade beams and footings to completely protect concrete adjacent to earth. Overlap joints and install seam tape and pipe boots, and seal penetrations as instructed by manufacturer.

3.2 FLOOR AND SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

After placing slabs, surface shall be leveled to an F_F 15 - F_L 13 tolerance. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, or sand-bed terrazzo, and as otherwise indicated.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Surface shall achieve an F_F 20 - F_L 17 tolerance.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

D. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final troweling operation, free of trowel marks, uniform in texture and appearance and to a F_F35/ F_L30 tolerance (F_L17 for elevated slabs). Grind smooth surface defects, which would telegraph through applied floor covering system.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

F. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application. A sample panel is required.

G. Liquid Densifier/Sealer: Apply liquid densifier/sealer on exposed interior floors subject to vehicular abrasion and as indicated on the Drawings. Compound shall be mechanically scrubbed into the surface in strict accordance with the directions of the manufacturer and just prior to completion of construction.

3.3 DEFECTIVE WORK

A. Imperfect or damaged work, or any material damaged or determined to be defective before final completion and acceptance of the entire job, shall be satisfactorily replaced at the Contractor's expense and shall be in conformity with all of the requirements of the Contract Documents. Removal and replacement of concrete work shall be done in such a manner as not to impair the appearance or strength of the structure in any way.

3.4 CLEANING

A. Upon completion of the work, all forms, equipment, protective coverings and any rubbish resulting therefrom, shall be removed from the premises. Finished concrete surfaces shall be left in clean and perfect condition, satisfactory to the Owner. Sweep with an ordinary broom and remove all mortar, concrete droppings, loose dirt, mud, etc.

3.5 REPAIR OF DEFECTIVE AREAS

A. With prior approval of the Architect/Engineer, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Section 5.3.7, using the polymer repair mortars and/or epoxy adhesives furnished by The Euclid Chemical Company, Sika Chemical Corp., or Architect approved equal.

END OF SECTION

SECTION 033500-CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Finishing concrete floors [and floor toppings].
2. Floor surface treatment.

B. Related Sections:
1. Section 033000 - Cast-in-Place Concrete: [Prepared concrete floors ready to receive finish;] [control and formed expansion and contraction joints and joint devices].
2. Section 03360 - Concrete Finishes: Exposed aggregate finish.
3. Section 033900 - Concrete Curing.
4. Section 079513 - Expansion Joint Cover Assemblies.
5. Section 079200 - Joint Sealers.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.

B. ASTM International:
1. ASTM E1155 - Standard Test Method for Determining Floor Flatness and of Levelness Using the F-number System.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on concrete hardener, sealer, curing compounds curing papers and slip resistant treatment, compatibilities, and limitations.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

B. Deliver materials in manufacturer's packaging including application instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

1.8 COMPOUNDS - HARDENERS AND SEALERS

A. Chemical Hardener: Magnesium fluorosilicate and zinc fluorosilicate blend

PART 2 EXECUTION

2.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify floor surfaces are acceptable to receive the Work of this section.

2.2 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.

B. Wood float surfaces receiving quarry tile, ceramic tile, and cementitious terrazzo with full bed setting system.

C. Steel trowel surfaces receiving carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set quarry tile, and thin set ceramic tile.

D. Steel trowel surfaces which are scheduled to be exposed.

2.3 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155, within 48 hours after slab installation.

C. Finish concrete to achieve the following tolerances:
1. Under Glazed Tile on Setting Bed: F(F) 35 and F(L) 20.
2. Under Resilient Finishes: F(F) 75 and F(L) 50.
3. Exposed to View and Foot Traffic: F(F) 75 and F(L) 40.

4. Correct slab surface when actual F(F) or F(L) number for floor installation measures less than required.

D. Correct defects in defined traffic floor by grinding or removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

END OF SECTION

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SECTION 033900-CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes initial and final curing of horizontal and vertical concrete surfaces.

B. Related Sections:
1. Section 033000 - Cast-In-Place Concrete.
2. Section 033500 - Concrete Finishing.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
3. ACI 308.1 - Standard Specification for Curing Concrete.
4. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on curing compounds, mats, paper, film, compatibilities, and limitations.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

PART 2 PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound Type 1.

B. Membrane Curing Compound: ASTM C1315 Type I.

C. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate surfaces are ready to be cured.

3.2 INSTALLATION - HORIZONTAL SURFACES

A. Cure concrete in accordance with ACI 308.1.

B. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

****** [OR] ******

C. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

****** [OR] ******

D. Absorptive Mat: Spread cotton fabric over floor slab areas. Spray with water until mats are saturated, and maintain in saturated condition for 7 days.

****** [OR] ******

E. Absorptive Mat: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.

3.3 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution Requirements: Protecting finished Work.

B. Do not permit traffic over unprotected floor surface.

3.4 SCHEDULES

A. Storage Area Slabs: Absorptive mats, burlap-polyethylene type.

B. Retaining Walls: Membrane curing compound, acrylic type, clear color.

C. Concrete Pavement: Membrane curing compound, opaque color.

D. Other Floor Areas: Membrane curing compound, acrylic type, translucent color.

END OF SECTION

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SECTION 036000-GROUT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Portland cement grout.
2. Rapid curing epoxy grout.
3. Non-shrink cementitious grout.

B. Related Sections:
1. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society of Testing and Materials:
1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
5. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
6. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
7. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacings and Polymer Concretes.
8. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
1. CRD C621 - Non-Shrink Grout.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
a. Corrosion of steel.
b. Volume change increasing shrinkage cracking.
c. Efflorescence.
d. Excess air entraining.

C. Fine Aggregate:
1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID CURING EPOXY GROUT

A. Rapid Curing Epoxy Grout: High strength, three component epoxy grout formulated with thermosetting resins and inert fillers. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids and alkalies.

Compressive Strength	ASTM C579	12,000 psi at 7 days
Tensile Strength	ASTM C307	2,000 psi minimum
Coefficient of Expansion	ASTM C531	30x10-6 in per degree F
Shrinkage	ASTM C827	None

2.3 NON-SHRINK CEMENTITIOUS GROUT

A. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D non-shrink grout:

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	2 hours (Approx)
		Final	3 hours (Approx)
Expansion			0.10% - 0.4% Maximum
Compressive Strength	CRD-C621	1 day	4,000 psi
		7 days	7,000 psi
		28 days	10,000 psi to 10,800 psi

2.4 FORMWORK

A. Refer to Section 031000 for formwork requirements.

2.5 CURING

A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

B. Rough concrete lightly, but not enough to interfere with placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.2 MIXING

A. Portland Cement Grout:
1. Use proportions of 2 parts sand and 1 part cement, measured by volume.
2. Prepare grout with water to obtain consistency to permit placing and packing.
3. Mix water and grout in two steps; pre-mix using approximately 2/3 of water;after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.
4. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
5. Do not add additional water after grout has been mixed.
6. Capable of developing minimum compressive strength of 2400 psi in 48 hours and 7000 psi in 28 days.

****** [OR] ******

3.3 PLACING GROUT

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.

E. Thoroughly compact final installation and eliminate air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.4 CURING

A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.5 FIELD QUALITY CONTROL

A. Submit proposed mix design of each class of grout to inspection and testing firm for review prior to commencement of Work.

B. Tests of grout components may be performed to ensure conformance with specified requirements.

END OF SECTION

SECTION 051200-STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Structural shapes.
2. Channels and angles.
3. Hollow structural sections.
4. Structural pipe.
5. Structural plates and bars.
6. Fasteners, connectors, and anchors.
7. Fasteners, connectors, and anchors.
8. Grout.

B. Related Sections:
1. Section 036000 - Grout: Grout for setting base plates.
2. Section 052100 - Steel Joists.
3. Section 053123 - Steel Roof Deck
4. Section 055000 – Metal Fabrications: Steel Fabrications affecting structural steel work.

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC Code of Standard Practice for Steel Buildings and Bridges.
2. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
3. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
4. AISC Seismic Provisions for Structural Steel Buildings.
5. AISC Specification for Allowable Stress Design of Single-Angle Members.
6. AISC Specification for the Design of Steel Hollow Structural Sections.
7. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
7. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
8. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
9. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
10. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
11. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
12. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
13. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
14. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
15. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
16. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
17. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
18. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100-mm) Thick.
19. ASTM A618 - Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.
20. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
21. ASTM A847 - Standard Specification for Cold-Formed Welded and Seamless High Strength, Low Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance.
22. ASTM A852/A852M - Standard Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick.
23. ASTM A913/A913M - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST).
24. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
25. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
26. ASTM E94 - Standard Guide for Radiographic Examination.
27. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.

28. ASTM E165 - Standard Test Method for Liquid Penetrant Examination.
29. ASTM E709 - Standard Guide for Magnetic Particle Examination.
30. ASTM F436 - Standard Specification for Hardened Steel Washers.
31. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
32. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
33. ASTM F1852 - Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Paint.
3. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
4. SSPC SP 3 - Power Tool Cleaning.
5. SSPC SP 6 - Commercial Blast Cleaning.
6. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
2. Connections.
3. Cambers
4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Mill Test Reports: Submit indicating structural strength and destructive and non-destructive test analysis.

D. Manufacturer’s Mill Certificate: Certify products meet or exceed specified requirements.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualifications within previous 12 months.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. AISC Code of Standard Practice for Steel Buildings and Bridges.
2. AISC Code of Standard Practice for Steel Buildings and Bridges. Section 10.
3. AISC Seismic Provisions for Structural Steel Buildings.
4. AISC Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
5. AISC Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings.
6. AISC Specification for the Design of Steel Hollow Structural Sections.
7. AISC Specification for Allowable Stress Design of Single-Angle Members.
8. AISC Load and Resistance Factor Design Specification for Single-Angle Members.
9. RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
10. ASCE 19.

1.5 COORDINATION

A. Section {013000 - Administrative Requirements}: Requirements for coordination.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

A. Structural W-Shapes: ASTM A992/A992M; Grade 50

B. Structural M-Shapes: ASTM A36/A36M; Grade 50

C. Structural T-Shapes: Cut from structural W-shapes.

D. Channels and Angles: ASTM A36/A36M.

E. Round Hollow Structural Sections: ASTM A500, Grade B.

F. Square and Rectangular Hollow Structural Sections: ASTM A500, Grade B.

G. Structural Plates and Bars: ASTM A36/A36M.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

A. Bolts: ASTM A307; Grade A or B.
1. Finish: Unfinished

B. High Strength Bolts: ASTM A325; Type 1 or ASTM A490; Type 1.

1. Finish: Unfinished

C. Nuts: ASTM A563 heavy hex type.
1. Finish: Unfinished

D. Washers: ASTM F436; Type 1, circular
1. Finish: Unfinished

E. Threaded Rods: ASTM A36/A36M; Grade A.
1. Finish: Unfinished

F. Forged Structural Steel Hardware:
1. Clevises and Turnbuckles: ASTM A108; Grade 1085.
2. Eye Nuts and Eye Bolts: ASTM A108; Grade 1030.
3. Sleeve Nuts: ASTM A108; Grade 1018.
4. Rod Ends, Yoke Ends and Pins, Cotter Pins, and Coupling Nuts: Carbon steel.

2.3 WELDING MATERIALS

A. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 ACCESSORIES

A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 7,000 psi at 28 days

B. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

2.5 FABRICATION

A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.6 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 3.

B. Shop prime structural steel members.

C. Galvanizing for Structural Steel Members: ASTM A123/A123M; minimum 1.2 oz/sq ft coating thickness; galvanize after fabrication.

D. Galvanizing for Fasteners, Connectors, and Anchors:
   1. Hot-Dipped Galvanizing: ASTM A153/A153M.
   2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Shop test bolted and welded connections as specified for field quality control tests.

C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
   1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify bearing surfaces are at correct elevation.

C. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION

A. Furnish templates for installation of anchor rods and embedments in concrete and masonry work.

3.3 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field weld components and shear connectors indicated on Drawings.

C. Field connect members with threaded fasteners; tighten to snug tight for bearing type connections.

D. Do not field cut or alter structural members without approval of Architect/Engineer.

E. After erection, touch up welds and abrasions to match shop finishes.

3.4 GROUT INSTALLATION

A. Grout [under base plates in accordance with Section 036000.

B. Shim bearing plates and equipment supports to proper elevation, snug tighten anchor bolts.

C. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.

D. Moist cure grout.

E. Remove forms after grout is set. Trim grout edges to from smooth surface, splayed 45 degrees.

F. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.5 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

C. Maximum Offset From Alignment: 1/4 inch.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Bolted Connections: Inspect in accordance with AISC specifications.
   1. Visually inspect all bolted connections.
   2. For Direct Tension Indicators, comply with requirements of ASTM F959. Verify that gaps are less than gaps specified in Table 2.

C. Welding: Inspect welds in accordance with AWS D1.1.
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Visually inspect all welds.
   3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.
   4. Liquid Penetrant Inspection: ASTM E165.

D. Correct defective bolted connections and welds.

END OF SECTION

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SECTION 052100-STEEL JOISTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.

B. Related Sections:
1. Section 051200 - Structural Steel: Superstructure framing.
2. Section 053110 – Steel Floor Deck
3. Section 053123 - Steel Roof Deck
4. Section 055000 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC Seismic Provisions for Structural Steel Buildings.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
6. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
7. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
8. ASTM F436 - Standard Specification for Hardened Steel Washers.
9. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

C. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.

D. Steel Joist Institute:
1. SJI K - Standard Specifications for Open Web Steel Joists, K-series.
2. SJI LH/DLH - Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series.
3. SJI JG - Standard Specification for Joist Girders.

E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC SP 1 - Solvent Cleaning.
3. SSPC SP 10 - Near-White Blast Cleaning.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Shop Drawings:
1. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist leg extensions.
2. Joist coding, bridging, connections, attachments.
3. Connection details.
4. Cambers

C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. Steel Joist Institute.

1.5 QUALIFICATIONS

A. Design connections not detailed on drawings under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Texas.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufactures: to be certified by SJI
1. Vulcraft Steel Joist
2. SEYCO Joist Company
3. Or approved equal

B. Open Web Joists Members: SJI Type K. LH Longspan. DLH Deep Longspan and joist Girders.

C. Nuts: ASTM A563 heavy hex type.
   1. Finish: Unfinished

D. Washers: ASTM F436; Type 1
   1. Finish: Unfinished

E. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.

F. Welding Materials: AWS D1.1; type required for materials being welded.

2.2 FABRICATION

A. Furnish bottom and top chord extensions as indicated on drawings.

B. Fabricate to achieves minimum end bearing of:
   1. 2-1/2 inches on steel.
   2. 4 inches on masonry.

2.3 FINISH

A. Shop prime joists and supplementary framing members. Do not prime surfaces that will be fireproofed.

B. Prepare joist component surfaces in accordance with SSPC SP 2.

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Furnish shop testing and analysis of steel sections.

B. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
   1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

3.2 ERECTION

A. Erect and bear joists on supports.

B. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.

C. Coordinate placement of anchors in masonry construction for securing bearing plates.

D. After joist alignment and installation of framing, field weld joist seat to bearing plates or angles.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Frame floor and roof openings greater than 18 inches with supplementary framing.

G. Do not permit erection of decking until joists are bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

H. Do not field cut or alter structural members without approval of Architect/Engineer.

I. After erection, prime welds, abrasions, and surfaces not shop primed

3.3 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: ¼ inch.

C. Maximum Offset From Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspect members, connections, welds, and tightening of high strength bolts in slip-critical connections.

END OF SECTION

SECTION 053110-STEEL FLOOR DECK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel floor deck and accessories.
2. Bearing plates and angles.

B. Related Sections:
1. Section 032000 - Concrete Reinforcement.
2. Section 051200 - Structural Steel: Support framing for deck openings.
3. Section 052100 - Steel Joists: Support framing for deck openings [and shear stud connectors].
4. Section 053123 - Steel Roof Deck.

1.2 REFERENCES

A. American Society of Civil Engineers:
1. ASCE 3 - Standard Practice for the Construction and Inspection of Composite Slabs.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
5. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

C. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.

D. Steel Deck Institute:
1. SDI 29 - Design Manual for Composite Decks, Form Decks and Roof Decks.

E. SSPC: The Society for Protective Coatings:
1. SSPC Paint 15 - Steel Joist Shop Paint.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

F. Underwriters Laboratories Inc.:
1. UL - Fire Resistance Directory.

G. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.

1.3 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI 29 Design Manual and ASCE 3.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASCE 3 for composite decks.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

B. Cut plastic wrap to encourage ventilation.

PART 2 PRODUCTS

2.1 FABRICATION

A. Metal Deck: Sheet steel, configured as follows:
1. Span Design: multiple double single.
2. Minimum Metal Thickness Excluding Finish: 28 gage.
3. Nominal Height: 0.6 inch, fluted profile [to SDI 29 [NR] [IR] [WR]].

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect metal deck in accordance with SDI 29 Manual.

3.2 FIELD QUALITY CONTROL

A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

SECTION 05 40 00

COLD FORMED METAL FRAMING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Labor, services, materials, supplies, equipment, tools, transportation, and facilities required in connection with or incidental to metal roof decking, as described in this Section, shown on Drawings, or reasonably implied therefrom, including, but not limited to:
   1. Light gauge steel framing designed to receive structural loads
   2. C-shaped load-bearing steel studs

1.2 QUALITY ASSURANCE

A. Coordinate the requirements on the Structural Drawings with the requirements of this Section. If a conflict exists, notations on the Structural Drawings take precedence.

B. The following document governs the Work, except where more restrictive items are specified:
   1. AISI Design of Cold-Formed Steel Structural Members

C. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

D. Studs, tracks, channels, and other light gauge framing members shall conform to requirements of ASTM C955.

E. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units that have been approved by governing authorities that have jurisdiction.

1.2 REFERENCES

A. American Iron and Steel Institute (AISI)
   1. Specification for the Design of Cold-Formed Steel Structural Members

B. ASTM International (ASTM)
   1. ASTM A1003/A1003M-05 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
   2. A653, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   3. A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
   4. A924, General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
   5. ASTM C954-04 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

6. C955, Load-Bearing (Traverse and Axial) Steel Studs, Runners (Track) and Bracing or Bridging for Screw Application of Panel Products and Metal Plaster Bases
7. ASTM C1007-04 Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

C. Metal Lath/Steel Framing Association (ML/SFA)
1. Steel Framing Manual

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer's installation instructions.

B. Shop Drawings: Provide shop drawings prepared by cold-formed metal framing manufacturer. Indicate size, material, and finish. Show locations and installation procedures along with wind load criteria (see structural drawings). Include details of joints, attachments, and clearances.

C. Supplementary Design Details: The general design is presumed adequate to permit compliance with the specified performance. Provide engineering calculations to supplement the general design. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of Texas.

1.4 PRODUCT DELIVERY AND STORAGE

A. Protect and store metal framing and related accessories from rusting and damage in accordance to AISI's "code of Standard Practice". Deliver to the project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off the ground in a dry ventilated space or protect with suitable waterproof coverings.

1.5 PRE-INSTALLATION CONFERENCE

A. Section 01 31 13 – Project Coordination.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers listed whose products meet or exceed the specifications may be used on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions in order to be considered.
1. Allied Studco, Inc.
2. CLARKWESTERN Building Systems
3. Dietrich Industries, Inc.
4. Fire Trak Corp.
5. Marino Ware Industries
6. The STEEL Network, Inc.
7. Unimast Incorporated
8. Delta Metal Products
9. Wheeling Corrugating Co.

10. Nucor Building Components

2.2 MATERIAL

A. Basic System Components: With each type of metal framing required, provide manufacturer's standard steel top track, runner track (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for the applications indicated, as needed to provide a complete metal framing system.

B. Steel Stud System:
   1. Stud Type: C-shaped galvanized steel studs, with punched web and minimum 1-5/8 inch flanges with flange return lip.
   2. Gauge:
      a. 12, 14, and 16 gauge formed from steel conforming to ASTM A1003 & A653, SQ, Grade 50, with 50,000 PSI minimum yield.
      b. 18 gauge formed from steel conforming to ASTM A1003 & A653, SQ, Grade 33, with 33,000 PSI minimum yield.
   3. Sizes: As indicated or required.
   4. Track, Bridging, Bracing and Misc. Items: Galvanized steel
      a. 18 gauge formed from steel conforming to ASTM A1003 & A653, SQ, Grade 33, with 33,000 PSI minimum yield, same flanges as studs, except provide Deflection Track (DT) with two (2) inch flange minimum for top of stud walls at floor or roof above, typically. Provide manufacturers standard head and by-pass clips for vertical deflection.
   5. “Z” Clips: 22 gauge galvanized steel; six (6) inches long.
   6. Slotted Deflection Track: Manufacturer’s single, deep-leg, U-shaped steel track: punched with vertical slots in both legs. Steel Sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   7. Headers and Jambs: Manufacturer’s proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened
   8. Channel Bridging or Bracing: U-Channel Assembly; Base metal thickness of .0538 inch (1.37mm) and minimum ½ inch (12.7mm) wide flanges.

C. Anchorage and Fastenings:
   1. Self-Drilling Self-Tapping Screws, Bolts, Nuts and Washers: Of type and size recommended by manufacturer to suit application, with hot-dip galvanized finish.
   2. Anchorage Devices: Power driven or powder actuated, drilled expansion bolts; or screws with sleeves.
   3. Welding: AWS D1.1

D. Finish:
   1. Galvanizing: Provide minimum G60 galvanized coating in accordance with ASTM A1003 & A653.
   2. Galvanizing Repair Paint: ZRC cold galvanizing compound or Galvalite manufactured by ZRC Worldwide, Marshfield, MA; Galvax Zinc-rich Cold Galvanizing Coating manufactured by Alvin Products, Inc., Lawerence, MA; or paint complying with military specification MILP-21035A, Type I or II. Apply repair paint in accordance with ASTM A780.

2.3 MINIMUM DESIGN

A. Provide adequate support for the following conditions, where not detailed or noted otherwise.

1. Wind Load: As required by code officials having jurisdiction.
2. Deflection: 1/600 for clear simple spans
3. Deflection: 1/300 for cantilever conditions and roof parapets
4. Gauge: 18 gauge minimum, unless noted otherwise.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Prior to the start of installation of metal framing systems, meet at the Project site with the installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.

3.2 FABRICATION

A. General: Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion in any members in the assembly.

B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with the manufacturer. Wire tying of framing components is not permitted.

3.3 ERECTION

A. General:
1. Track Anchors: Install anchors maximum 4 feet-0 inches on center; design anchors and spacing to carry live, dead and wind loads.
2. Track Splices: Provide channel inserts or weld track splices.
3. Erection: Install members plumb, level, and in a true plane.
4. Fastenings: Make assembly rigid and secure, with welds free of voids and burnouts.

B. Install metal framing systems in accordance with stud manufacturer's printed instructions.

C. Runner Tracks:
1. Install continuous tracks sized to match studs.
2. Align tracks accurately to layout at base and tops of studs.
3. Secure tracks as recommended by stud manufacturer, except do not exceed 24 inches on center for nail or power-driven fasteners, nor 16 inches on center for other types of attachment.
4. Provide fasteners at corners and ends of tracks.
5. Tracks shall be anchored to structural steel prior to installing sprayed on insulation.
6. Provide Deflection Track (DT), at top of stud walls at floor or roof above, typically. Allow for 1/2 inch movement of primary structure. Do not attach studs directly to Deflection Track.
7. Vertical Deflection Clips: Provide manufacturer’s standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure

D. Secure studs to top track and bottom runner track by means of approved self-drilling screws or welding at both inside and outside flanges of 14 gauge or heavier material.

Screws and welds shall be of sufficient size to insure strength of connection. All welding shall comply with American Welding Society "Specification for Welding Sheet Steel in Structures."

E. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

F. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure. Use Zee clips as specified above. Weld "Z" shaped clips to structural members as shown on drawings. Maximum 2 feet on center vertical.

G. Install supplementary framing, blocking and bracing in the metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering the weight or loading resulting from the item supported.

H. Frame wall openings with extra studs, equal to the number of studs interrupted by wall openings, placed at each side of wall openings. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with shoes or by welding, and space jack studs same as full-height studs of the wall. Secure stud system all around to wall opening frame in the manner indicated.

I. Install bracing/bridging in accordance with manufacturer’s instructions and design conditions.

J. Touch up field welds and damaged galvanized coating, except touch up of field cut studs is not required.

K. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

L. Install horizontal stiffeners in stud system, space (vertical distance) at no more than 54 inches on center. Weld at each intersection.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Miscellaneous metal items and their related components which are not necessarily individually described shall be furnished and installed in accordance with the intent of the drawings and specifications and as required to complete the work.

B. The Work of this Section is governed by Section 05 12 00, Structural Steel, except where more stringent requirements are contained herein or on the Structural Drawings. If a conflict exists, notations on the Structural Drawings take precedence.

1.2 REFERENCES

A. Conform to the following reference standards as applicable to the work:
1. American Institute of Steel Construction (AISC), Code of Standard Practice for Steel Buildings and Bridges, latest edition.
2. American Institute of Steel Construction (AISC), Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, latest edition.
3. American Iron and Steel Institute (AISI)
4. ASTM International (ASTM)
   a. A36, Standard Specification for Carbon Structural Steel
   b. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
   c. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   d. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
   e. A307, Standard Specification for Carbon Steel Bolts and Studs 60,000 psi Tensile Strength
   f. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   g. B210, Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
   h. B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
5. American Welding Society (AWS)
   a. D1.1 Structural Welding Code
6. Steel Structures Painting Council (SSPC)
   a. Painting Manual, Volume 1, Good Painting Practice
   b. Painting Manual, Volume 2, Systems Specifications
7. National Ornamental & Miscellaneous Metals Association (NOMMA)
   a. Guideline 1 – Joint Finishes.

1.3 SUBMITTALS

A. Shop Drawings:
1. For off-the-shelf items: Show all layouts, sizes, methods of construction and installation, including sizes and types of all fastening devices.

2. For custom fabricated items: Submit design calculations for the materials and their connections designed by the Contractor, prior to or with the shop drawings. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of Texas. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal. Design Calculations will be retained for the Architect's file, and will not be approved or returned.

B. Samples: As noted.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. As scope and performance documents, the Drawings and Specifications do not necessarily indicate or describe all the work required for the performance and completion of the Work. Contracts will be let on the basis of such documents with the understanding that the Contractor shall furnish and install the items required for proper completion of the Work without adjustment to price or schedule. Work shall be of sound, quality construction and the Contractor shall be solely responsible for the inclusions of adequate labor and materials to cover the proper and timely fabrication and installation of the miscellaneous metal items indicated, described, or implied.

B. As a performance specification, the criteria for the solution of structurally sound miscellaneous metal items indicated on the Drawings or specified herein are the sole purpose of defining the design intent and performance requirements. The details shown are intended to emphasize the acceptable profiles and performance requirements for this Project. To avoid any misunderstanding or lack of interpretation, the Contractor is hereby advised that the responsibility for the miscellaneous metal items are totally his and that designs and resolutions proposed in the Contractor's shop drawings, structural calculations, and related documentation shall be demonstrated throughout the Work and warranty period specified or required.

C. Design proposal submissions which follow exactly the details indicated on the Drawings, will not relieve the Contractor of his responsibility for the design, fabrication, erection, or performance of the Work of this Section.

D. In the event of a controversy over the design, the decision of the Architect will take precedence.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel: Comply with ASTM A36.

B. Welding:
1. Comply with American Welding Society (AWS) Code.
2. Comply with National Ornamental & Miscellaneous Metals Association (NOMMA Guideline 1: Joint Finishes) for joint finishes in the following locations:
   a. Finish #1: Interior handrails and guardrails
   b. Finish #2: Typical ornamental metals exposed to view, interior and exterior, except as indicated above. (canopies, exterior railings and guardrails, non-accessible sculptural fabricated metal, etc.)
   c. Finish #3: Miscellaneous metals exposed interior non-public spaces, and exterior miscellaneous metals, except as indicated above. (ladders, bollards, etc.)

d. Concealed welding: no requirement, unless otherwise indicated or required for safety or conformance with requirements of other portions of the work.

C. Bolts:
1. Comply with ASTM A307.
2. Size: 3/4 inch, unless otherwise noted.

D. Anchors:
1. Expansion bolts:
   a. 1/4 inch or less, Rawl Calk-Ins or Arrow Series 4000.
   b. Greater than 1/4 inch: Rawl Multi-Calks. Top shall be 1/2 inch below concrete surface.
2. Molly screw anchors:
   a. In walls 1/16 inch to 5/8 inch thick, use "S" length
   b. In walls 5/8 inch to 1/4 inch thick, use "L" length
   c. In walls 1-1/4 inch to 1-3/4 inch thick, use "XL": length.
3. Nelson stud anchors:
   a. Comply with ASTM A108.
   b. Concrete Embed: Headed, low carbon steel, non-threaded, galvanized, standard ferrule as required

E. Shop Priming:
1. Shop coat any ungalvanized ferrous metal with primer, except for those to receive application of spray-applied fireproofing shall be free of primer and paint.
2. Clean iron and metal to be primed of scale, dirt and dust by steel scrapers, wire brushers or sandblasting. Remove oil and grease with petroleum naphtha.
3. Thoroughly work paint into all joints by brush. Overall application of brush or spray coat of red oxide primer in accordance with SSPC - Paint 25.
4. Give any painted built-in portions one field coat of primer on all abraded parts after installation.

F. Galvanized Metal:
1. Comply with ASTM A123.
2. General: Galvanize all steel sections which are fully or partially exposed to weather, regardless if they are scheduled to receive a finish coat of paint or not.
3. Galvanized items to be painted shall be primed as outlined in Painting and Staining Section.
4. Hot-dip galvanized after fabrication.
5. Silicone protective coating shall not be used at galvanized items scheduled to receive paint.
6. Galvanizing Repair Paint: ZRC cold galvanizing compound or Galvilite manufactured by ZRC Worldwide, Marshfield, MA; Galvax Zinc-rich Cold Galvanizing Coating manufactured by Alvin Products, Inc., Lawerence, MA; or paint complying with military specification MILP-21035A, Type I or II. Apply repair paint in accordance with ASTM A780.

G. Stainless Steel:
1. General: Comply with ASTM Standards as applicable to the work.
2. Type: Type 302 or 304 as applicable to the work.
3. Finish:
   a. Concealed: No. 2D finish
   b. Exposed: No. 4, unless noted otherwise.

H. Aluminum:
1. General: Comply with ASTM Standards as applicable to work.
2. Type: 6061 or 6063 as applicable to work.
3. Finish:
   a. Concealed: Mill finish
   b. Exposed: Mill finish, or Anodized or Kynar 500 or Hylar 5000 finish a specified in color selected by Architect from manufacturer's standard colors.

2.2 MISCELLANEOUS METAL ITEMS

A. The following is a list of the principal miscellaneous metal items to be furnished under this Section. This list is offered only as a guide and Contractor shall thoroughly check drawings for other miscellaneous metals. All items exposed to the exterior shall be hot-dip galvanized after fabrication.

1. Guard Post (Bollards):
   a. Provide 6.625 inch O.D. Schedule 40 hot-dip galvanized steel pipe guard post (bollards) as detailed on the drawings. Fill with 2,500 PSI concrete after installation and round off concrete top. Place in concrete footing as detailed on drawings. Galvanize pipe after fabrication. Paint as directed by Architect in accordance with Section 09 91 00.
2. Sign Posts:
   a. Accessible Parking Sign Posts: 2 inch by 12 inch galvanized steel tube with integral welded galvanized post cap, painted in color selected by Architect.
      1) Post Anchor Bolts: Two (2) galvanized 1/2 inch by 6-1/8 inch Nelson stud anchor bolts welded to steel tube front and back.
   b. Signs: Refer to Section 10 14 00, Graphics.
3. Handrails and Brackets:
   a. Steel Pipe Handrails and Brackets: Furnish and install 1-1/2 inch O.D. Schedule 40 steel pipe rails for outdoor stairs and ramps, unless noted otherwise. Brackets shall be wall type. Include all other components required for finished installation. All work shall comply with local codes and Texas Accessibility Standards (TAS). Hot dip galvanized all components after fabrication.
   b. Aluminum Handrails and Brackets: Furnish and install 1-1/2 inch O.D. aluminum pipe rails for indoor stairs and ramps, unless noted otherwise. Brackets shall be wall type. Include all other components required for finished installation. All work shall comply with local codes and Texas Accessibility Standards (TAS).
5. Steel Ladders: Fabricate from 2-1/2 inch by 3/8 inch flat bar steel stringer with 3/4 inch steel rod rungs let into stringers, welded and ground smooth. Provide all angle supports and anchoring devices for bolting to wall, floor, or structure as required. Hot-dip galvanize after fabrication.
6. Steel Ships Ladders: Fabricate from steel shapes as shown, weld joints and grind smooth. Provide cages where shown. Hot-dip galvanize after fabrication.
7. Masonry Anchors (At steel columns): Fabricate from 5/16 inch dia. steel, galvanized after fabrication; field weld to columns, space not more then 24 inches o.c. vertically to coincide with horizontal mortar joint elevations. Refer to Structural Drawings.
8. Loose Lintels: Fabricate from steel shapes as shown on drawings, weld joints and grind smooth. Hot-dip galvanize after fabrication.

9. Frame Supports: Construct above ceiling frame supports for aluminum entrances and storefronts, hollow metal frames of channels and/or tubes, with all anchorage devices as detailed or required.
10. Below and Above-Ceiling Supports: Construct of UNISTRUT members or as approved by Architect to size and shaped detailed. All work shall be accurate to 1/8 inch plus or minus. Provide supports complete with fastenings to structure for overhead equipment.
11. Shelf Angles for Masonry: Sizes and shapes as detailed. Use specified galvanized steel for angles on exterior walls. Paint exposed surfaces in accordance with section 09 91 00.
12. Access Doors: Provide one (1) 2 feet-0 inches by 2 feet-0 inches at each restroom plumbing chase wall. If not shown on drawings, locate as indicted by Architect's field representative. Approved Manufacturers: Bar-Co., Cesco Products, J. L. Industries, Karp Associates, Milcor Inc., Nystrom Inc., and The Williams Brothers Corp. Provide painted finish.
13. Condenser Water Pump Base Plate: Fabricate from steel plate with holes for anchor bolts as shown on drawings or required. Hot dip galvanize after fabrication. Provide stainless steel anchor bolts of size, type, and finish as shown or recommended by fabricator to suit application.
14. Conduit Trenches, Frames and Covers:
    a. Trench Pan: Heavy Metal Form Pan with 12 inch interior trench width dimension and four (4) inch depth.
    b. Trench: Type EXTC-B with Type R Cover with recess design to accept vinyl composition tile. Cover shall be set 1/8 inch above concrete floor so that the finished top is flush with the finished VCT floor.
    c. Locations: As shown on drawings.
    d. Acceptable Manufacturer: McKinley Iron Works, Fort Worth, Texas; (800) 792-2273, or Architect approved equal.
15. Sidewalk Trench Covers and Frames: Provide trench covers and frames at sidewalks where shown on drawings or required. Approved Product/Manufacturers: Type TGLB-10 as manufactured by McKinley Iron Works, Fort Worth, Texas; (800) 792-2273; Barrycraft Pedestrian-Handicap/Bicycle Trench Grating B-PED-A2 as manufactured by Barry Pattern & Foundry Company, Inc. Birmingham, Alabama (800) 524-1809; or Architect approved equal.
16. Cast Iron Downspout Boots: Provide cast iron downspout boots conforming to Type DS4 as manufactured by McKinley Iron Works, Inc., Fort Worth, TX; (800) 792-2273, or Architect approved equal. Provide downspout boots with standard rust inhibitive primer. Paint downspout boots in the field to match the color of downspouts as selected by Architect in accordance with Section 09 91 00.
17. Bicycle Racks: Provide and install (3) Single entry bicycle racks. Design Basis for bicycle racks is Porter model number 00391-000. Bicycle Racks shall consist of unitized welded spreader frame constructed from galvanized steel. The unit is approximately 10’-6” long by 3’-6” wide and each shall be constructed to hold (10) bicycles. All hardware and labor shall be provided to anchor the units to the concrete sidewalk as depicted in the drawings.
18. Decorative Aluminum Guardrail and Handrail System:
    a. Panels: All panels are pre-designed 30 inch square aluminum modules with design as indicated on drawings. Powder coated finish shall be as selected by Architect from manufacturer’s available colors.
    b. Posts: Standard aluminum post shall be two (2) inches by three (3) inches. Corner post application shall use a three (3) inch square section or, if not a 90 degree corner application, two (2) posts shall be used either side of the corner. Posts shall be mounted to the structure by welding the internal steel supporting structure to an embedded steel

plate. Post finish shall be powder coated in color selected by Architect from manufacturer's available colors.

c. Handrail: 1-1/2 inch O.D. aluminum pipe in satin, non-directional finish.
d. Location: Second Floor and stairs as indicated on the drawings.
e. Approved Product/Manufacturer: Design Basis for Panel Railing System as manufactured by Livers Bronze Company, Kansas City, MO (816) 300-2828;
Architectural Metal Crafts, Houston, TX (281) 449-1881; Big D Metalworks, Dallas, TX (800) 299-9767; Sterling Dula, Austin, TX (512) 794-8617; York Metal Fabricators, Inc., Oklahoma City, OK (405) 528-7495; or Architect approved equal; refer to Division 1 for substitutions process.

21. Field Fabricated Ornamental Railing:
a. Panels: 2 feet-6 inches by 2 feet-6 inches, steel, paint, match design configuration and intermediate panel component sizes similar to Livers Bronze Style No. 18.
b. Posts: As shown on drawings, steel, paint.
c. Corner Posts: As shown on drawings, steel, paint.
d. Cap Rail:
1) Style: 3-1/2 inch O.D. Rail Cap.
2) Metal: Extruded aluminum, clear anodized.
e. Side Rail: 1-1/2-inch diameter extruded aluminum handrail and bracket as specified above.
f. Finish:
1) Paint Color: As selected by Architect from manufacturer's available colors in accordance with Section 09 91 00, Painting.

22. Aluminum Column Covers:
a. Covers shall be extruded aluminum, .145 thickness with clear anodized finish, fabricated in two vertically divided sections attached with demountable interlock assembly.
b. Fasteners: concealed.
c. Manufacturer to provide support structures
d. Locations: as shown on drawings.
e. Basis of Design: Series 2000 by Pittconn Industries, Riverdale, MD; (800) 637-7638; or Architect approved equal.

B. Other Miscellaneous Items: Miscellaneous metal items and their related components are not necessarily individually described. Miscellaneous items not described shall be furnished and installed in accordance with the intent of the drawings and specifications and as required to complete the work.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Separate all dissimilar metals.

B. Welded Joint Finishes: Where welding is exposed to view, welds shall be executed neatly then ground smooth. Pits and blemishes are not acceptable. Provide joints as stated above in accordance with NOMMA Guideline 1.

C. For manufactured items, adhere to printed manufacturer's installation instructions.

D. Refer to painting section for items that are to receive paint.

END OF SECTION

SECTION 05 80 00

EXPANSION CONTROL

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Floor expansion joint cover assemblies, wall and ceiling expansion joint cover assemblies, and fire barrier systems where indicated on drawings or required.

1.2 RELATED WORK

A. Section 03300 - Cast-In-Place Concrete

B. Section 04200 - Unit Masonry

C. Section 05500 - Miscellaneous Metals

D. Section 07721 - Roof Accessories: Roof expansion joints.

E. Section 07900 - Building Sealants

1.3 REFERENCES

A. ASTM International (ASTM)
   1. B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   2. B221, Specification for Aluminum-Alloy, Extruded Bars, Rods, Wire, Shapes, and Tubes
   3. D2000, Classification System for Rubber Products in Automotive Applications

B. Underwriters Laboratories, Inc. (UL)
   1. Fire Performance Characteristics

1.4 QUALITY ASSURANCE

A. Materials and work shall conform to the latest edition of reference specifications specified herein and to all applicable codes and requirements of local authorities having jurisdiction.

B. Fire Performance Characteristics: Where indicated, provide expansion joint cover assemblies to meet UL requirements.
   1. Fire Rating: Not less than the rating of adjacent construction.

C. Loading Characteristics: Standard floor covers should be designed to withstand a minimum point load of 500 lbs. without damage or permanent deformation.

D. Single-Source Responsibility: Obtain expansion joint cover assemblies from one source from a single manufacturer.

1.5 SUBMITTALS

A. Product Data: Submit copies of manufacturer's latest published literature for materials specified herein for approval, and obtain approval before materials are fabricated and delivered to the site.

B. Certificates: Material test reports from qualified independent testing laboratory indicating and

interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

C. Shop Drawings: Submit shop drawings for work specified herein for approval and obtain approval prior to fabrication and shipment of materials to the job site.
1. Shop Drawings showing full extent of expansion joint cover assemblies; include large scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joinery with other types, special end conditions, anchorages, fasteners, and relationship to adjoining work and finishes. Include description of materials and finishes and installation instructions.

D. Samples: Samples of materials specified herein and shall be submitted for approval, and approval obtained before materials are delivered to the site. Samples shall include the following:
1. Samples for each type of metal finish indicated on metal of same thickness and alloy to be used in work.
2. Samples of each type of flexible seal to be used in work with color samples as above.

1.6 DELIVERY, STORAGE AND HANDLING

A. Exercise proper care in the handling of all work so as not to injure the finished surface, and take proper precautions to protect the work from damage after it is in place.

B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical.

C. Store materials under cover in a dry and clean location off the ground. Remove materials which are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials at no additional cost.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed whose product meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
1. Architectural Art Mfg., Inc.
2. Balco Metalines
3. Construction Specialties, Inc. (C/S Group)
4. D & B X-pansion Joints, Inc.
5. JointMaster Architectural Joint Systems (InPro Corporation)
6. MM Systems Corporation
7. Watson Bowman Acme

B. Specifications are based on products of Construction Specialties, Inc. (C/S Group).

2.2 MATERIALS

A. Aluminum: ASTM B221, alloy, 6063-T5 for extrusions; ASTM B209, alloy 6061-T6, for sheet and plate.

B. Protective Coating: Zinc chromate primer or chromate conversion coating for protection of aluminum surfaces in contact with cementitious materials.

C. Fire Barriers: Designed for indicated or required dynamic structural movement without material degradation or fatigue.

D. Accessories: Manufacturer's standard anchors, fasteners, set scores, spacers, flexible vapor seals and filler materials, drain tubes, adhesive and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 FABRICATION

A. Provide expansion joint assemblies of design, basic profile, materials, and operation indicated. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes direction or abuts other materials. Include closure materials and transition pieces, tee-joints, corner, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.

B. Interior Joint Covers (As shown or required)
1. Floor to Floor:
   a. Model ALR-100: Recessed flush at carpet to carpet, and vinyl tile to vinyl tile.
   b. Model ALS-100: Recessed flush at tile paver to tile paver.
2. Wall to Wall:
   a. Model AFW-100: Recessed flush at gypsum board walls.
   b. Model SM-N at CMU walls.
3. Corner Floor to Wall: Model ALRW.
4. Corner Wall to Wall:
   a. Model AFWC-100: Recessed flush at gypsum board walls
   b. Model SMC-N at CMU walls
5. Corner Wall to Ceiling: Model SMC.
6. Ceiling to Ceiling: Model SM.
7. Unexposed Areas: 0.030 inch thick Formed Galvanized Steel Cover.

C. Fire Barriers: Provide "Reflex" Model at Second Floor slab joints in fire rating as scheduled or required to complete UL assembly.

C. Aluminum Finishes: Clear Anodized Finish - AA-C22A41; medium matte etched finish with 0.07 mil thick minimum thick anodic coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Make a thorough examination of all surfaces receiving the Work of this Section, and before starting the installation, notify Architect, in writing, of any defect which would affect the satisfactory completion of the Work of this Section.

3.2 PREPARATION

A. Examine the Contract Drawings and Specifications in order to insure the completeness of the work required under this Section.

B. Verify all measurements and dimensions at the job site and cooperate in the coordination and scheduling of the Work of this Section with the work of related trades, with particular attention given to the installation of items embedded in concrete and masonry so as not to delay job progress.

C. Provide all templates as required to related trade for location of all support and anchorage items.

3.3 INSTALLATION

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.

B. Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

C. Perform all cutting, drilling and fitting required for installation of expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels.

D. Set floor covers at elevations to be flush with adjacent finished floor materials. If necessary, shim to level, but ensure base frames have continual support to prevent rocking and vertical deflection.

E. Locate wall, ceiling, roof, and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with all required accessories.

F. Locate anchors at intervals recommended by manufacturer, but not less than three (3) inches from each end and not more than 24 inches on center.

G. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames.

H. Installation of Fire Barrier:
Install fire barrier in accordance with Federal, State, and local building codes using manufacturer's recommended procedures.
Install transition and end joints to provide continuous fire resistance and in accordance with manufacturer's instructions.

CLEANING

Do not remove strippable protective material until finish work in adjacent areas is complete.

When protective material is removed, clean exposed metal surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All rough carpentry items including, but not limited to:
   1. Wood blocking for support of items supported on or recessed into wood framing or requiring wood blocking for support.
   2. Wood cants, nailers, curbs, and other items associated with roofing work.
   3. Miscellaneous framing items and plywood sheathing.

1.2 RELATED WORK

A. All Sections of Work supported on or recessed into wood framing or requiring wood blocking for support, such as wall trim, wall cabinets, handrails, lockers, toilet compartments, toilet and bath accessories, markerboards, tack boards, projection screens, fire extinguisher cabinets, etc., as applicable to the Project.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s data on wood treatment materials.

1.4 STANDARDS AND GRADING

A. All lumber used structurally shall be graded and marked with grade and trademark of a lumber grading organization approved by the Architect, except that a certification of grade from such a grading organization may be accepted in lieu of grade and trademarks when approved by Architect. Trademark of manufacturer shall also appear on each piece.

B. Each piece of plywood used shall carry the American Plywood Association trademark.

C. Grading Rules: Conform with all applicable requirements of American Lumber Standards "Simplified Practice Recommendations R-16" and to grading rules of manufacturer's association under whose rules the lumber is produced.

D. Reference Standards: Conform with all requirements.
   1. U.S. Dept. of Commerce Product Standards (PS)
   2. American Plywood Association (APA)
      a. Standards and Construction Guide
   3. American Wood Preservers Association (AWPA)
      a. Standards, as they apply.
   4. Architectural Woodwork Institute (AWI)
      a. "Quality Standards"
   5. National Woodwork Manufacturers’ Association (NWMA)
      a. Standards
   6. Western Wood Products Association (WWPA)
      a. Manual

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber:
1. Treated No. 2, S4S Southern Yellow Pine, #1 kiln dried.
   a. Comply with NWMA Standards
   b. Use for blocking, stripping, grounds, cants and miscellaneous wood items in contact with concrete, roofing, or exposed to the weather.
2. No. 2, S4S Southern Yellow Pine: Use for framing, blocking, stripping and miscellaneous concealed interior lumber not exposed to concrete, roofing weather or moisture, when FRS lumber is not required by building code.
3. Fire Retardant No, 2, S4S Southern Pine: Refer to Fire Retardant Treatment below. Use for framing, plates and blocking in all walls and partitions where required by building code or noted on drawings.

B. Plywood:
1. General: Comply with APA Standards.
2. APA A-D, Group 1 Interior used where appearance of only one side is exposed to view for interior locations. Use for wall liner at MDF/IDF closets and telephone boards in mechanical and telephone rooms where shown or required. 3/4 inch thick unless required or shown otherwise. Paint as scheduled in Section 09 91 00.
3. Exterior plywood, Group 1, APA rated sheathing. Use where miscellaneous plywood is exposed to concrete, weather, or at roof construction as sheathing.
4. Fire Retardant Treated Plywood: Refer to Fire Retardant Treatment below. Use when required by building code or noted on drawings.
5. Underlayment: If shown or required, APA rated Sturdi-floor, exterior grade, tongue and groove edges.

C. Rough Hardware:
1. Nails, Spikes, and Staples: Galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations: Size and type to suit application. Do not use to resist “pull-out” loads.
2. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application. Galvanize for exterior locations, high humidity locations, and treated wood. Plain finish for other interior locations.
3. Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry and concrete. Bolts or power activated type for anchorage to steel.

D. Wood Treatment:
1. Preservative Treatment (Concealed Conditions):
   a. Borate: Pressure impregnate preservative to net retention of 0.28 lbs./cu.ft., in plant licensed by manufacturer in accordance with the following standards:
      1) Preservative Treatment Standard: AWPA P5\
      2) Structural Lumber Treatment Standard: AWPA C31
      3) Plywood Treatment Standard: AWPA C9
   b. Brush two (2) coats of preservative on bored or sawn surfaces of treated lumber.
   c. Provide Quality Mark Stamp or end tag identifying third party inspection agency on treated wood for identification.

d. Concealed conditions mean conditions that are interior, above ground that are not exposed to direct standing water, in contact with natural grade, or exposed to weather.
e. ACQ and CCA preservatives not permitted.
f. Acceptable Manufacturers: Osmose “Advance Guard”; Universal Forest Products “ Prowood Borate”; or Architect approved equal.

2. Fire Retardant Treatment:
a. Lumber shall be pressure-impregnated with non-combustible fire retardant chemicals in accordance with U.L. FRS Fire Hazard Classification. All lumber must be dried following treatment in accordance with AWPA Standard C20.
b. Plywood shall be pressure-impregnated with non-combustible fire retardant chemicals in accordance with U.L. FRS Fire Hazard Classification. All plywood must be dried following treatment in accordance with AWPA Standards C27.

PART 3 - EXECUTION

A. Wood Framing:
1. Framing and blocking shall be accurately cut and fitted true to line and levels, avoiding shims and wedges.
2. Spiking and nailing shall be done using largest size spikes and nail practicable.
3. Unless otherwise shown, use 2 inch by 4 inch wood studs spaced 16 inches o.c. with 4 inch face perpendicular to direction of wall or partition. Provide single bottom plate and double-top plates 2 inches thick by width of studs.
4. Bolt nailers and blocking to steel, masonry or concrete members with bolts or proportionate strength of members attached from each end, except as otherwise noted on plans.
5. Provide blocking, bucks and framing as necessary and for other trades as required.
6. Drill lumber accurately for bolts and fit all bolts with suitable washers.

B. Plywood:
1. Install plywood over framing in accordance with instruction of American Plywood Association Construction Guide Form No. E30C.
2. Install underlayment plywood as shown in accordance with instructions of American Plywood Association. Space panel joints and edges 1/32 inch. Fill and sand panel edge joints, surface roughness, and damaged or open areas. Nail with 4d ring-shank nails spaced at six (6) inches at edges and eight (8) inches in field each way.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY AND MILLWORK

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Providing all finish carpentry items including, but not limited to:
   1. Finish Carpentry
   2. Millwork and Cabinetry
   3. Plastic Laminate
   4. Casework Hardware
   5. Miscellaneous Millwork

B. Installation of:
   1. Finish hardware
   2. Plastic laminate faced wood doors

1.2 RELATED WORK

A. Section 06 10 00 - Rough Carpentry

B. Section 08 14 23.16 - Plastic Laminate Faced Wood Doors

C. Section 08 71 00 - Finish Hardware

D. Section 09 91 00 - Painting and Staining

E. Section 12 35 50 – Educational Casework

F. Section 12 35 53 – Laboratory Casework

1.3 REFERENCES

A. American National Standards Institute:
   1. ANSI A156.9 - Cabinet Hardware
   2. ANSI A161.1 - Woodwork Testing Standards
   3. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. Architectural Woodwork Institute:
   1. AWI - Quality Standards Illustrated.

C. National Electrical Manufacturers Association:
   1. NEMA LD 3 - High Pressure Decorative Laminates.

1.4 PERFORMANCE REQUIREMENTS

A. Unless otherwise indicated, perform work in accordance with AWI “Quality Standards Illustrated”, Custom Grade, except where specification exceeds those standards, the more stringent shall govern.

B. Fabricate millwork and cabinetry in accordance with ANSI A161.1, NEMA LD3, and general static load testing performed and certified by an independent testing agency, covering the following areas of product performance, with these minimum results:
   1. Base cabinet construction/racking test: 800 lbs.
   2. Cabinet front joint loading test: 425 lbs.
   3. Wall cabinet static load test: 2,000 lbs.
   4. Drawer front joint loading test: 600 lbs.
   5. Drawer construction/static load test: 750 lbs.
   6. Cabinet adjustable shelf support device/static load test: 300 lbs.

C. Shelf Loading: Comply with loading/deflection standards of the Composite Panel Association.

1.5 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer’s preprinted product information for all hardware proposed on the project.
   3. Manufacturer’s preprinted maintenance instructions for the casework hardware.

B. Shop Drawings:
   1. Indicate size, material and finish.
   2. Show locations and installation procedures, including hardware, sinks, service fixtures, trim and other pertinent data for each unit.

C. Certification: Provide manufacturer’s certification that casework has been fabricated and installed according to AWI “Custom” Grade guidelines or better.

D. Samples: Two (2) each, 6 inch by 6 inch by 3/4 inch sample of specified particleboard core with grade stamp for use as verification of installed product.

E. Closeout:
   1. Record Drawings: indicate revisions to original drawings and shop drawings
   2. Manufacturer contact names, addresses and phone numbers.
   3. Finish Material Schedule: names and color numbers of laminates and stains.
   4. Keys: Provide additional master key for each room and additional locksets totaling one percent of total project for attic stock.

1.6 QUALITY ASSURANCE

A. Manufacturer: Minimum of five (5) years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.

B. Delivery conference: 48 hours prior to delivery, notify Architect of delivery date and time. At the Architect’s discretion, a representative of the Architect may be present at the time of delivery. Casework not conforming to the specified requirements, as reasonably determined by the Architect’s representative, shall be removed and returned to manufacturer for repair or replacement at no additional cost to the Owner or increase in time.

1.7 PRE-INSTALLATION CONFERENCE

A. Section 01 31 13 – Project Coordination.

1.8 PRODUCT HANDLING

A. Deliver completed laminate clad casework, countertops and related products only after wet operations in building are completed. Store in ventilated place, protected from the weather, with relative humidity range of 20 to 50 percent.

B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.9 JOB CONDITIONS

A. Environmental Requirements: do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least one (1) week.
   1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
   2. After installation, control temperature and humidity to maintain relative humidity between 25 and 55 percent.

B. Conditions: Do not store or install casework in building until concrete, masonry, and drywall/plaster work is dry.

1.10 COORDINATION

A. Coordinate the Work of this Section with plumbing work specified in Division 15. Coordinate sink opening construction with sinks specified in Division 15.

B. Coordinate location of blocking in walls for installation and support of wall cabinets.

1.11 WARRANTY

A. Warranty the work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to the following:
   1. Rough or difficult operation, or loose or missing parts.
   2. Delamination of surfaces.
   3. Noticeable deterioration of finish.
   4. Warped or misaligned surfaces or telegraphing of subsurface imperfections.

PART 2 - PRODUCTS

2.1 MILLWORK MANUFACTURERS

A. Manufacturers listed below are certified by AWI Quality Certification Program and are listed for the Contractor's convenience only and shall not preclude the Contractor from using other manufacturers, provided they produce equivalent products of the type specified for the scope and size of the Project. Other manufacturers must have experience manufacturing products meeting or exceeding the specifications and must

comply with the criteria specified in paragraph 1.6 above and with Division 1 requirements regarding substitutions.

1. Casework:
   a. Ameritek Design, Inc., Houston, TX (281)442-7767
   b. Calmar Manufacturing Co., Inc., Calmar, IA (563)562-3261
   c. Case Systems, Inc., Midland, MI (989) 496-9510
   d. Global Casework Manufacturing, Inc., Sugar Land, TX; (281) 494-6181
   e. Imperial Mill & Fixture, Inc., Corpus Christi, TX; (361) 883-4630
   f. Jericho Woodworks, Sugarland, TX; (281) 313-5780
   g. LSI Corporation of America, Inc., Minneapolis, MN; (763) 559-4664
   h. MGC Millwork, LP, Stafford, TX (281) 340-1400
   i. Robert Shaw Mfg. Co., Inc., Fort Worth, TX (817) 927-2557
   j. South Texas Woodmill, Inc., Brownsville, TX; (956) 831-3304
   k. Stevens Industries, Inc. Teutopolis, IL (217) 540-3100
   l. Terrill Manufacturing Co., San Angelo, TX; (915) 655-7133
   m. TMI Systems Design Corp., Dickenson, ND; (701) 225-6716
   n. Victoria Cabinetworks, Victoria, TX (361) 578-0263

2.2 MILLWORK MATERIALS

A. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD3, and the following requirements:
   2. Exterior Color Selection Available:
      a. Architect to select from minimum of 250 selections available, including wood grain patterns and solid colors.
      b. Provide 5 different colors available per project.
      c. If laminate has wood grain, direction of grain shall be vertical on door, end panels, fascia panels, and exposed backs; horizontal on drawer faces, aprons, and top rails.
   2. Laminate grades:
      a. Exposed doors, finished end panels, and other vertical surfaces: GP28 (0.028 inch thick nominal)
      b. Horizontal surfaces other than top: GP28 (0.028 inch thick nominal)
      c. Cabinet Liner: CL20 (0.020 inch nominal), white.
      d. Work Surfaces and Countertops: GP50 (0.050 inch thick nominal) with BK20 (0.20 inch thick) backer sheet.
      e. Backsplash: PH42 (0.042 inch nominal) with nominally balanced backer sheet.
   3. Adhesive: PVA water resistant adhesive. Contact adhesives not permitted.
   4. Pressure Fused Laminate:
      a. NEMA LD3 VGL, and NEMA LD3 CLS, Melamine resin impregnated, 120 gram PSM minimum, thermofused to core under pressure.
      b. Color:
         1) Closed interiors, underside of wall cabinets: White.
         2) Exposed and Semi-exposed open cabinets: Match exterior.
      c. Provide balanced construction with same thermofused melamine. Unsurfaced coreboard or simple backers not allowed.

B. Core Material:
   1. Particleboard: ANSI 208.1, minimum 45 pcf density, Grade M-3.
   2. Plywood: Shop sanded, exterior grade veneer cored, hardwood faced, any species, with no defects affecting strength or utility. Overlay plywood not permitted. Plywood allowed at countertops and toe-base only.

3. Water resistant treated plywood: shall have 24 hour thickness swell factor of five percent or less and 24 hour water absorption factor of ten percent or less; P.S. 51, Type II or better.
4. Cabinet components shall be of the following minimum core thicknesses:
   a. Cabinet backs, drawer body, and drawer bottoms: 1/2 inch particleboard
   b. Door and drawer face, base, wall, and tall cabinet tops and bottoms, cabinet sides, drawer spreaders, cabinet back rear hangstrips, structural dividers, and exposed cabinet backs: 3/4 inch particleboard
   c. Work surfaces and countertops: minimum 1 inch particleboard or plywood, except use water resistant treated plywood core at counters with sinks.
   d. Shelves: 3/4 inch particleboard core for 30 inches long or less, 1 inch thick particleboard core for more than 30 inches long; 14 inch deep, unless otherwise noted. Provide vertical dividers for shelves over 36 inches long.
   e. Cabinet Toe-Base: 3/4 inch plywood. No particleboard within four (4) inches of floor.

C. Countertops and Backsplashes:
1. Countertops: Provide countertops with PVC edge in as long as practical continuous lengths. Provide field glued splines at joints. No joints closer than 24 inches either side of sink cutout.
2. Backsplash: Integral to countertop, 4 inch high unless otherwise shown. Fabricate with single continuous sheet of laminate from front counter to top of splash with no joints from horizontal to vertical application. No joints shall occur at sink openings.
3. At exposed countertop end corners, provide 1 inch radius, or similar safety treatment.

D. Sinks: Refer to Division 15. Sizes as shown on drawings. Provide sealant at sink cut-outs.

E. Service Fixtures: Refer to Division 15.

F. Toe Spaces: Leave toe spaces unfinished for installation of resilient base, unless otherwise shown.

G. End Panels and Filler Strips: Match adjacent case-piece.

H. Edging:
1. Provide the following in accordance with “Edging Locations”:
   a. Flat Edge PVC: 0.020 inch. Solid, high-impact, purified, color-thru, acid resistant, machine-applied with hot melt adhesives.
   b. 3 mm PVC: Solid, high-impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, and machine profiled to 1/8 inch radius.
2. Edging Locations:
   a. Cabinet body edge, including door/drawer front spacer rail: Flat Edge PVC, color matched to door/drawer face or as selected.
   b. Forward edge of interior body components, interior dividers, shelf, and top edges of drawer body: Flat Edge PVC to match cabinet interior surface color.
   c. Door/Drawer-Front edging: 3mm PVC, color matched to standard laminates.

2.3 CABINET HARDWARE

A. All hardware shall meet ANSI A156.9 and shall be subject to approval by the Architect. All keying shall match existing master key system and be approved by the Owner.
   1. Acceptable Manufacturers:
      a. Accuride
      b. National
      c. Knape & Vogt
      d. Ives
      e. Stanley
      f. As specified herein, provide specified product, or Architect approved equal.

B. Hinges:
   1. Heavy duty, five-knuckle 2 3/4 inch institutional type hinge shall meet ANSI/BHMA A156.9 Grade 1 requirements. Mill ground, hospital tip, Teflon coated tight pin feature with all edges eased. Hinge shall be full wrap around type of tempered steel 0.095 inch thick. Each hinge shall have minimum of 9 screws, #7, 5/8 inch FHMS to assure positive door attachment.
   2. One pair per door to 48 inch height. One and one-half pair over 48 inches in height. Hinge shall accommodate 13/16 thick laminated door and allow 270 degree swing.
   3. Acceptable Product/Manufacturer: Institutional Hinge No. 100742, Dull Chrome (Cabinetmakers Hardware, 2002, Volume 6B), or approved equal.

C. Pulls:
   1. Wire design, 4 inches, Chrome, US26D finish.

D. Sliding Door Hardware:
   1. Frameless 1/4 inch glass sliding doors: double track rolling door assembly.
   2. Framed 13/16 inch thick stile and rail sliding doors: top mounted track with dual roller hangers. Vertical adjustment for accurate alignment.

E. Drawer Slides:
   1. Standard Drawers: 3/4 extension, self-closing, white epoxy-coated, lever disconnect, positive in-stop/out-stop, nylon rollers, minimum 100 pound dynamic load rating at full extension.
   2. File Drawers: Full extension, 3-part progressive opening slide, precision steel ball bearing, minimum 100 pound dynamic load rating at full extension, zinc plated or epoxy coated at manufacturer's option.
   3. Provide body mounted molded rails for hanging file system for legal or letter size as indicated by manufacturer's model number. Cutting or machining of drawer body/face not permitted.
   4. Paper Storage Drawers: Full extension, self-closing, white epoxy-coated, lever disconnect, positive in-stop/out-stop, nylon rollers, minimum 150 pound dynamic load rating at full extension.

F. Catches: Provide opening resistance in compliance with the Americans with Disabilities Act.
   1. Provide top-mounted magnetic catch for base and wall cabinet door.
   2. Provide two at each tall cabinet door. Catch housing shall be molded in White.

G. Adjustable Shelf Supports:
1. Dual-pin design with anti tip-up shelf restraints for both 3/4 inch and 1 inch shelves.
2. Include keel to retard shelf slide-off, and slot for mechanical attachment of shelf to clip.
3. Load rating shall be minimum 300 pounds each support without failure.

H. Wardrobe Rod: 1 inch diameter plated steel rod, with captive sockets.

I. Coat Hooks: Single and double prong, wall mount - Satin Aluminum.

J. Locks: Five-disk tumbler cam-style with strike. Locks on cabinets in same room keyed alike. Provide two (2) keys per room where doors and drawers are scheduled to receive locks. Dull chrome finish. Lock core shall be removable with a control key, permitting Owner to change lock arrangements without tools.

2.4 SPECIALTY ITEMS

A. Grommets:
1. Size: 2-1/2 inches diameter with “Flip-Top”™ tab in cap.
2. Colors: As selected by Architect from manufacturer’s available colors.
3. Number/Location: Where electrical, telephone, and computer data wiring need to pass through tops whether shown or not.
4. Approved Product/Manufacturer: Model No. EDP3 manufactured by Doug Mockett & Company, Inc., Manhattan Beach, CA; (800) 523-1269, or Architect approved equal.

B. Keyboard Drawers (At all knee spaces):
1. Approved Product/Manufacturer: No. SD-1 as manufactured by Knape & Vogt; or Architect approved equal.

C. Molded Personal Pencil Drawer: High-impact 100 Polystyrene with in-stop, out-stop, and self-closing features. Provide under top mounted 100 lb self-closing slides. Twelve compartment drawer body, and slides, Black. Provide where indicated on plans.

2.5 SOLID STOCK

A. Moisture Content: Percent of moisture in relation to over-dry weight shall be between 8 percent and 13 percent at time of installation.

B. Natural Finish Hardwood:
1. Occasional knot permitted provided it is tight and smooth.
2. Grain Pattern: Rift-cut
3. Species: AWI "Premium" Grade, White Oak

C. Paint Grade Hardwood: Any species, including Parana Pine, Except do not use Oak, Elm or similar species which have coarse grain.

2.6 MISCELLANEOUS

A. Utility Shelving: AWI "Economy" grade.

B. Clothes Rod: 1-1/2 inch diameter smooth wooden dowel by length required, with end supports and fasteners of type recommended to suit application.

C. Telephone/MDF/IDF Board: Provide minimum 4 foot by 8 foot by ¾ inch thick plywood for telephone/data punch down blocks and video equipment in accordance with Section 06 10 00, Rough Carpentry. Paint in accordance with Section 09 91 00, Painting.

2.9 MILLWORK FABRICATION

A. Fabricate casework, countertops and related products to dimensions, profiles and details shown on drawings. Fabricate casework square, plumb, and true.

B. Detailed Requirements For Cabinet Construction:
   1. Toe-Base:
      a. Continuous, ladder type platform with concealed fastening to cabinet bottom, level and secured to floor
      b. Toe-base at exposed cabinet end panels shall be recessed 1/4 inch from face of finished end, for flush installation of finished base material.
      c. No cabinet sides-to-floor will be allowed.
   2. Cabinet Top and Bottom:
      a. Solid sub-top shall be furnished for all base and tall cabinets.
      b. At cabinets over 36 inches bottoms and tops shall be mechanically joined by a fixed divider.
      c. Assembly devices shall be concealed on bottom side of wall cabinets.
   3. Cabinet Sides:
      a. Doweled, and glued under pressure, or attached with fully concealed interlocking mechanical fasteners to sub-top and bottom.
      b. Drill holes for adjustable shelves 1-1/4 inches on center.
   4. Cabinet Backs:
      a. Side bound, captured in grooves, recessed from cabinet rear, and securely fastened at top and bottom.
      b. Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide minimum of two (2) at base, two (2) at wall, and three (3) at tall cabinets as instructed by casework manufacturer.
      c. Provide removable back panels and closure panels for plumbing access at all sink cabinets, and where shown on drawings.
   5. Exposed end corner and face frame attachment:
      a. Butt joint, glued and finish nailed; or attached with fully concealed interlocked mechanical fasteners.
   6. Door and Drawer Fronts:
      a. Drawer fronts and hinged doors shall overlay the cabinet body. Maintain a maximum 1/8 inch reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
      b. Where indicated, provide Stile and Rail doors with full 1/4 inch plate glass, hinged or sliding. Exposed lite-opening edges shall be trimmed and glazed with extruded glazing bead.
      c. Where indicated, frameless sliding glass doors shall be 1/4 inch thick plate glass with ground and polished edges. Fit with anodized aluminum shoes and nylon rollers.

C. Drawers:
   1. Drawer fronts: apply to separate drawer body component sub-front.
   2. Drawer sides: doweled to receive front and back, glued under pressure, machine squared.

3. Drawer bottom: set into front and sides, 1/4 inch deep groove with minimum 3/8 inch standing shoulder, continuously glued. Reinforce drawer bottoms with 1/2 inch by 4 inch front-to-back intermediate underbody stiffeners, mechanically fastened. One at 24 inches, two at 36 inches, and over.
4. Paper storage drawers: fitted with full width hood at back.
5. Hanging file drawers shall be fabricated to accept letter size hanging folders compatible with Pendaflex system.

D. Vertical and Horizontal Dividers: As required by manufacturer for type and style of component.

E. Door/Drawer Front Rail: As required by manufacturer for type and style of component, and hardware placement.

F. ADA, Americans with Disabilities Act Requirements: The following special requirements shall be met, where specifically indicated on architectural plans as “ADA”, or by General Note. Shall be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations:
1. Countertop height: With or without cabinet below, not to exceed a height of 34 inches Above Finished Floor (A.F.F.), at a surface depth of 24 inches
2. Kneespace clearance: minimum 29 inches A.F.F. at apron, and 30 inches clear span width.
3. 12 inch deep shelving, adjustable or fixed: Not to exceed a range from 9 inches A.F.F. to 54 inches A.F.F.
4. Wardrobe cabinets: Provide with rod/shelf adjustable to 48 inches A.F.F. at a maximum 21 inch shelf depth.
5. Sink cabinet clearances: In addition to above, upper kneespace frontal depth shall be no less than 8 inches, and lower toe frontal depth shall be no less than 11 inches, at a point 9 inches A.F.F., and as further described in Volume 56, Section 4.19.

PART 3 - EXECUTION

3.1 MILLWORK INSTALLATION

A. Positioning: Place approximately level, plumb and at right angles to adjacent work.

B. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging the products and adjacent work.

C. Anchorage: Attach securely so the products will perform to their maximum ability without damage from inadequate fastenings.

D. Fasten tops to frames with concealed clips, screws and glue.

3.3 FINISH HARDWARE INSTALLATION

A. The supplier will mark each item of hardware for location. Protect the markings until each item is installed. If any item is delivered to the job not properly marked, return it to the supplier for marking before attempting to install it.

B. Check markings on hardware for proper location. Install and make necessary adjustments for proper working order. Any hardware damaged by improper adjustment or careless abuse will be replaced by the Contractor at his expense.

C. Provide clean, properly sized and accurately placed mortises and drilled holes for all mortise hardware such as locksets and for cylindrical locks where specified only.

D. Fit all surface-applied hardware accurately.

E. After hardware is installed, protect exposed surfaces by use of heavy paper and masking tape and maintain until job completion.

F. Remove all finish hardware except that which is primed for painting before painter's finish is applied. Permanently replace and re-adjust for proper function after painter's finish has dried hard.

G. Millwork contractor shall be responsible for hardware on millwork.

3.4 PLASTIC LAMINATE FACED WOOD DOOR INSTALLATION

A. Protect all doors during handling.

B. Refer to Section 08 71 00, Finish Hardware for hardware requirements.

C. Install doors in accordance with manufacturer’s instructions.

D. Install and adjust doors for smooth, quite operation.

END OF SECTION

SECTION 07 14 00

WATERPROOF COATING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Application of waterproof coating at intersection of walls and concrete floors at Mechanical Rooms to ensure watertightness.

PART 2 - PRODUCT

2.1 APPROVED PRODUCT/MANUFACTURER

A. Specifications are based on Andek Rubberkote 1047 manufactured by Andek Corporation, Moorestown, NJ; (856) 786-6900. No substitutions will be permitted.

2.2 MATERIAL

A. Coating Type: Resin-based, air drying.

B. VOC: 400 grams/liter.

C. Pot Life: Single component.

D. Shelf Life: 12 months.

E. Recommended Thickness: 30 mils dry film thickness.

F. Coverage: 30 - 40 square feet per gallon.

G. Packaging: 3.5 gallon pails.

H. Color: Light gray

PART 3 – EXECUTION

3.1 INSTALLATION

A. Walls and concrete slabs shall be smooth, dry, and free of any foreign materials.

B. Use caulk or glass fabric on gypsum wallboard conditions before applying waterproof coating.

C. Use glass fabric on 3/8 inch void otherwise use caulk if less than 3/8 inch void.

D. Apply coating to four (4) inches high on walls and four (4) inches out from base.

E. Apply two (2) coats of specified finish in accordance with manufacturer's instructions.

F. Allow approximately 24 hours drying time between installation of coats. Do not apply second coat until Architect has inspected first coat application.

G. Install coating after all painting operations are completed.

END OF SECTION

SECTION 07 16 14

COLD FLUID-APPLIED WATERPROOFING (BELOW GRADE)

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparation of concrete surfaces to receive waterproofing membrane.

B. Sealing of cracks and joints.

C. Fluid applied waterproofing system, with prefabricated drainage composite or protection board at walls that fall below grade (auditorium, basement, elevator pit, etc.).

D. Pre-applied waterproofing system, with joint sealing tape, and other accessories at below grade horizontal surfaces under the slab or elevator pit.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-In-Place Concrete

B. Section 07 92 00 - Building Sealants

C. Division 23 - Mechanical: Mechanical penetrations, such as floor drains and piping, through waterproofing membrane.

D. Division 26 - Electrical: Electrical penetrations, such as conduit, through waterproofing membrane.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions.

B. Certifications:
   1. Manufacturer’s certification that applicator is approved by manufacturer.
   2. Manufacturer’s affidavit that materials used in Project contain no asbestos.

C. Warranty: Submit a sample warranty identifying the terms and conditions stated in warranty.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Applicator shall be experienced in applying the same or similar materials and shall be specifically approved in writing by the membrane system manufacturer.

B. Regulatory Requirements: Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).

1.5 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials job site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
   1. Name of material.
   2. Manufacturer's stock number and date of manufacture.
   3. Material safety data sheet (MSDS).

B. Store and handle in strict compliance with manufacturer’s instructions, recommendations and material safety data sheet (MSDS).

C. Protect from damage from sunlight, weather, excessive temperatures and construction operations.

D. Remove damaged material from the site and dispose of in accordance with applicable regulations.

E. Do not double-stack pallets of waterproofing on the job site. Provide cover on top and all sides.

F. Store drainage composite and protection board flat and off the ground. Provide cover on top and all sides.

G. Protect waterproofing materials from freezing. In cool temperatures, store the material for several hours at room temperature to facilitate mixing and application.

H. Sequence deliveries of materials to avoid delays but minimize on-site storage.

1.7 PROJECT CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive membrane waterproofing.

C. Coordinate waterproofing work with other trades to ensure adequate illumination, ventilation, and dust-free environment during application and curing of membrane. The applicator shall have sole right of access to the specified areas for the time needed to complete the application and allow the membrane to cure adequately.

D. Protect adjoining surfaces not to be coated against damage or soiling. Protect plants, vegetation and animals which might be affected by waterproofing operations.

E. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.

F. Keep products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs.

G. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

1.8 WARRANTY

A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.

PART 2 - PRODUCTS

2.1 FLUID APPLIED WATERPROOFING SYSTEM

A. Specifications are based on named manufacturer. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions to be considered.
1. Carlisle Coatings and Waterproofing Incorporated, Sapulpa, OK (Barricoat)
2. Grace Construction Products, W. R. Grace & Co.-Conn., Austin, TX

B. Waterproofing Membrane: Two (2) part, self-curing, synthetic rubber based material meeting or exceeding the performance requirements of ASTM C836 and other ASTM standards as indicated in the following table and conforming to W.R. Grace & Co. “Procor” waterproofing membrane.

Waterproofing Membrane Physical Properties, minimum:

Property	Test Method	Typical Value
Cured Film Thickness	ASTM D3767 Method A	1.5 mm (0.60 in.) nom
Solids Content	ASTM D1644	100 percent
Flexibility, 180 degree	ASTM D1970	Unaffected
Bend over 25 mm (1 in.)		
Mandrel at 32 degrees C (-25 degrees F)		
Elongation	ASTM D412	500 percent minimum
Peel Adhesion to Concrete	ASTM D903 Modified*	880 N/m (5 lbs./in.)

C. Accessory Products:
1. Prefabricated Drainage Composite: Shall be designed to promote positive drainage while serving as a protection course.
   a. Hydroduct® 660 Drainage Composite for use on all horizontal surfaces.
   b. Hydroduct® 220 Drainage Composite for use on all vertical surfaces.
2. Protection Board (Use only where prefabricated drainage composite is not used):
   a. Asphalt Hardboard: A pre-molded semi-rigid protection board consisting of bitumen, mineral core and reinforcement. Provide 3 mm (0.125 inch) thick hardboard on horizontal surfaces not receiving steel reinforced slab. Where steel reinforcing bars are to be used, apply two (2) layers of 3 mm (0.125 inch) thick hardboard or one (1) layer of 6 mm (0.25 inch) thick hardboard.

b. Expanded Polystyrene: 25 mm (1 inch) thick for vertical applications with the following characteristics:

Normal Density: 1.0 pcf^3
Thermal Conductivity, K factor: 0.24 at 40 degrees F, 0.26 at 24 75 degrees F
Thermal Resistance, R-Value: 4 per 1 inch of thickness.

D. Locations: Vertical below-grade retaining walls and walls that fall below grade 0'-0" and where shown on drawings.

2.2 PRE-APPLIED WATERPROOFING SYSTEM

A. Specifications are based on named manufacturer. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions to be considered.
1. Carlisle Coatings and Waterproofing Incorporated, Sapulpa, OK
2. Grace Construction Products, W. R. Grace & Co.-Conn., Austin, TX

B. Waterproofing Membrane: Composite sheet comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating. Membrane provides a continuous seal that resists water ingress and migration between the membrane and the structure. The waterproofing system shall conform to the following products as manufactured by W.R. Grace & Co.:
1. Membrane: Robust membrane for horizontal use below concrete slabs complying with Preprufe 200.
2. Tape: Self-adhesive 8 inch wide strip applied to the surface of the membrane along the line of all concrete joints (application temperature range minus 25 degrees F to 86 degrees F. Product shall conform to Preprufe CJ Tape LT; or in hot climates (minimum 50 degrees F), use Preprufe CJ Tape HC.
3. Sealing Membrane: For sealing around penetrations shall conform with Bituthene.

C. Locations: Below grade horizontal surfaces under the slab, and where shown on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before waterproofing work is started the all surfaces to be waterproofed shall be thoroughly examined for all deficiencies. Should deficiencies exist, the Architect shall be notified in writing and corrections made.

3.2 SURFACE PREPARATION

A. Surfaces to which waterproofing is to be applied shall be thoroughly clean, dry and free from all surface contaminates or cleaning residue that may harmfully affect the adhesion of the membrane.

B. Repair all cracks in accordance with manufacturer's instructions.

3.3 APPLICATION

A. Priming: Shall be in accordance with membrane manufacturer's instructions.

B. Apply waterproofing in accordance with membrane manufacturer's instructions.

C. Liquid membrane waterproofing on vertical walls shall positively overlap turned up sheet membrane waterproofing from under slab as instructed by the Manufacturer.

D. Where shown or required, install specified perimeter drainage system as the first course of drainage composite immediately after membrane has cured on vertical surfaces. Install manufacturer’s recommended drainage composite or protection board/protection course on remainder.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rigid board cavity wall insulation where shown on drawings or required.

B. Batt insulation used for thermal and sound insulation in stud walls, above soffit panels, above lay-in ceilings and where shown on drawings or required.

1.2 RELATED WORK

A. Section 07 11 00 - Dampproofing Above Grade

B. Section 07 84 00 - Firestopping and Fire Safing

C. Section 09 51 00 - Acoustical Lay-In Ceiling: Installation of acoustical insulation above lay-in ceiling panels as specified.

D. Division 23 - Mechanical: Duct insulation

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's literature on each insulation type specified.
2. Manufacturer's installation instructions for each insulation type specified.

B. Samples: Six (6) inch x six (6) inch piece of rigid insulation for Architect's approval.

C. Certifications:
1. Manufacturer's certification of compatibility of rigid insulation with dampproofing mastic.
2. Manufacturers affidavit that materials used in Project contain no asbestos.

1.4 COORDINATION

A. Furnish acoustical insulation to acoustical lay-in ceiling contractor for laying insulation above lay-in ceiling panel system specified.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS/PRODUCTS

A. Specifications are based on any of the manufacturers listed below, with their product in parenthesis for the particular insulation application. Other manufacturers not listed must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 regarding substitutions to be considered.

1. Rigid Wall Insulation:
   a. Extruded Polystyrene Foam Board:
      1) Dow Chemical Co. (Styrofoam Cavitymate Plus)
      2) Owens-Corning (Foamular CW25)
      3) Pactiv Building Products (GreenGuard-SB)
2. Batt Thermal Insulation:
   a. Walls: For use in partition thermal applications.
      1) CertainTeed Corp. (AcoustaTherm)
      2) Guardian Fiberglass, Inc. (Thermal & Sound Control Batts)
      3) Johns-Manville (Thermal-SHIELD Thermal Insulation)
      4) Knauf (QuietTherm Insulation)
      5) Owens-Corning (Thermal Batt Insulation)
3. Batt Acoustical Insulation (Sound Attenuation):
   a. Walls/Ceilings: For use in partition acoustical applications and above lay-in ceilings as specified and where shown on drawings.
      1) CertainTeed Corp. (CertaPro AcoustaTherm)
      2) Guardian Fiberglass, Inc. (Thermal & Sound Control Batts)
      3) Johns-Manville (Sound-SHIELD Sound Control Batts)
      4) Knauf (QuietTherm Insulation)
      5) Owens-Corning (Above Ceiling – Sonobatts; Walls – Sound Batt))
      6) Thermafiber Sound Attenuation Fire Blanket (SAFB) Insulation
4. Safing Insulation: As specified in Section 07 84 00, Fire Stopping and Fire Safing.

2.2 MATERIALS

A. Rigid Wall Insulation: (In Exterior Cavity Walls)
   1. Extruded Polystyrene Foam Board:
      a. Specification: ASTM C578, Type IV
      b. Thermal Resistance: R=5.0 per inch minimum.
      c. Water Absorption (% by volume): 0.1 maximum
      d. Water Vapor Permeance (perm): 1.1 per inch
      e. Compressive Strength: 15 psi minimum
      f. Thickness: 2 inches, unless shown otherwise
      g. Size: 16 inch x 96 inch sheets.

   2. Extruded Polystyrene Foam Board:
      a. Specification: ASTM C578, Type IV
      b. Thermal Resistance: R=5.0 per inch minimum.
      c. Water Absorption (% by volume): 0.1 maximum
      d. Water Vapor Permeance (perm): 1.1 per inch
      e. Compressive Strength: 15 psi minimum
      f. Thickness: 1 1/2 inches, unless shown otherwise
      g. Size: 16 inch x 96 inch sheets.

B. Batt Insulation:
   1. Thermal Insulation:
      a. Type: ASTM C665, Type 1, unfaced
      b. Thickness/R-Values (minimum):
         1) 3-1/2 inches/R-11 where shown on drawings.
         2) 6 inches/R-19 where shown on drawings.
      c. Surface Burning Characteristics:
         1) Flame Spread: 25 or less
         2) Smoke Developed: 50 or less

2. Acoustical (Sound Attenuation) Insulation:
   a. Type: ASTM C665, Type 1, unfaced
   b. Surface Burning Characteristics:
      1) Flame Spread: 25 or less
      2) Smoke Developed: 50 or less
   c. Thickness/R-Values (minimum):
      1) 3-1/2 inches/R-11 where shown on drawings.
      2) 6 inches/R-19 above lay-in ceiling specified and where shown on drawings.

C. Safing Insulation: As specified in Section 07 84 00, Fire Stopping and Fire Safing.

D. Miscellaneous Materials:
   1. Mechanical Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered or mechanically fastened to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
   2. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Rigid Board Insulation:
   1. Install board insulation at exterior masonry walls in accordance with manufacturer's printed instructions.
   2. Cut insulation to fit snugly around obstructions such as vents, pipe or conduit.
   3. Install board insulation to back-up wall surface secured by veneer wall ties and mastic.
   4. Install board insulation with joints tight to veneer wall ties and to provide full coverage.

B. Batt Insulation (Thermal and Sound):
   1. Walls:
      a. Insulation shall be friction fit between studs and provide full coverage where indicated on drawings.
      b. Insulation shall be tight within spaces in partitions, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through partitions.
      c. Wall areas above ceiling: At side wall insulation in ceiling cavity, install adhesive-mounted impaling devices with metal caps at 2 feet-0 inches vertically and at four (4) inches from each side of blankets horizontally. Install blankets with four (4) foot dimension running vertically on spikes, keeping blankets tight to exterior wall without crushing into each other.

C. Safing Insulation: As specified in Section 07 84 00, Fire Stopping and Fire Safing.

END OF SECTION

SECTION 07 26 20

FLUID APPLIED AIR BARRIER SYSTEM

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fluid-applied air barrier membrane in exterior wall assemblies.
2. Materials to bridge and seal the following air leakage pathways and gaps:
   a. Connections of the walls to the roof air barrier.
   b. Connections of the walls to the foundation air barrier.
   c. Seismic and expansion joints.
   d. Openings and penetrations of window frames, storefront, curtain wall.
   e. Barrier precast concrete and other envelope systems.
   f. Door frames.
   g. Piping, conduit, duct and similar penetrations.
   h. Masonry ties, screws, bolts and similar penetrations.
   i. All other air leakage pathways in the building envelope.

B. Related Work in other Sections includes but is not limited to the following:

1. Section 01 45 00 – Quality Control
2. Section 01 50 00 – Temporary Facilities and Controls
3. Section 03 30 00 – Cast-In-Place Concrete
4. Section 04 20 00 – Unit Masonry
5. Section 07 41 13 – Prefinished Metal Roofing
6. Section 07 54 19 – Fully Adhered Thermoplastic Membrane “Hybrid” Roofing System
7. Section 07 90 00 – Joint Sealants
8. Section 09 21 16 – Gypsum Wallboard Systems (Exterior Sheathing)

1.2 PERFORMANCE REQUIREMENTS

A. Material Performance: Provide air barrier materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.004 cfm / ft2 @ 1.57 psf), when tested in accordance with ASTM E2178 (unmodified).

B. Provide materials with a water vapor permeance [Water method (Procedure B)] of 10 US perms or greater, determined in accordance with ASTM E96.

C. Assembly Performance: Provide a continuous air barrier in the form of an assembly that has an air leakage not to exceed 0.04 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.04 cfm/ft2 @ 1.57 psf) when tested in accordance with ASTM E2357. The assembly shall accommodate movements of building materials by providing expansion and control joints as required. Expansion / control joints, changes in substrate and perimeter conditions shall have appropriate accessory materials at such locations.

1. The air barrier assembly shall be capable of withstanding combined design wind, fan and stack pressures, both positive and negative on the envelope without damage or displacement and shall transfer the load to the structure.
2. Fluid applied air barriers shall not displace adjacent materials in the air barrier assembly under full load.
3. The air barrier assembly shall be joined in an airtight and flexible manner to the air barrier materials of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.

D. Connections to Adjacent Materials: Provide connections to prevent air leakage at the following locations:

1. Foundation and walls, including penetrations, ties and anchors.
2. Walls, windows, curtain walls, storefronts, louvers or doors.
3. Different wall assemblies, and fixed openings within those assemblies.
4. Wall and roof connections.
5. Floors over unconditioned space.
6. Walls, floor and roof across construction, control and expansion joints.
7. Walls, floors and roof to utility, pipe and duct penetrations.
8. Seismic and expansion joints.
9. All other potential air leakage pathways in the building envelope.

1.3 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination

1.4 SUBMITTALS

A. Submittals: Submit in accordance with Division 1 requirements.

B. Quality Assurance Program: Submit evidence of current Contractor accreditation and Installer certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program (QAP). Submit accreditation number of the Contractor and certification number(s) of the ABAA Certified Installer(s).

C. Product Data: Submit material Manufacturer's Product Data, material Manufacturer's instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, Technical Data, and tested physical and performance properties.

1. Submit letter from primary air barrier material Manufacturer indicating approval of materials that are proposed to be used that are not currently listed in the accessories section of this specification for that Manufacturer's material.
2. Include statement from the primary air barrier material Manufacturer that the materials used in their air barrier assembly which will be used to adhere to the underlying substrate are chemically compatible to the substrate material.

D. Samples: Submit clearly labeled samples, three (3) inch by four (4) inch minimum size of each material specified.

E. Shop Drawings of Mock-Up: Submit Shop Drawings of proposed mock-ups showing plans, elevations, large-scale details, and air barrier transitions and terminations.

F. Field Test Results of Mock-Up: Submit test results of air leakage test and water leakage test of mock-up in accordance with specified standards, including retesting if initial results are not satisfactory.

G. Shop Drawings: Submit Shop Drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the materials are secured with air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.

1. Include VOC content of each material, and applicable legal limit in the jurisdiction of the project.
2. Include statement that materials are compatible with adjacent materials proposed for use.
3. Include required values for field adhesion test on each substrate in accordance with ASTM D4541 (modified), using a type II pull tester.

H. Compatibility: Submit letter from primary material Manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from Manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

1.5 QUALITY ASSURANCE

A. Air Barrier Installer Qualifications: Air barrier Subcontractor(s) shall be accredited at the time of bidding and during the complete installation period by the Air Barrier Association of America (ABAA) whose Installer(s) are certified in accordance with the site Quality Assurance Program used by ABAA.

1. Fluid-applied membrane air barrier Installer(s) shall be certified by BPQI (Building Performance Quality Institute) for the ABAA Quality Assurance Program in accordance with the requirements outlined in the QAP program used by ABAA. Installers shall have their photo identification air barrier certification cards in their possession and available on the project site, for inspection upon request.

B. Manufacturer: Obtain primary ABAA Evaluated Materials from a single ABAA Evaluated Manufacturer regularly engaged in manufacturing specified fluid-applied membranes. Obtain secondary materials from a source acceptable to the primary materials Manufacturer.

C. Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).

D. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

E. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, air barrier materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction and chemical/fire safety plans. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

F. Field Quality Assurance: Implement the site Quality Assurance Program requirements used by ABAA. Cooperate with ABAA auditors and any independent testing and inspection agencies engaged by the Owner. Do not cover the air barrier assembly until it has been inspected, tested and accepted.

G. Mock-Ups: Build mock-up representative of primary air barrier assemblies and glazing assemblies including backup wall and typical penetrations as acceptable to the Architect. Mock-up shall be dimensioned no less than eight (8) feet long by eight (8) feet high and include the air barrier materials and air barrier accessories proposed for use in the exterior wall assembly. Mock-ups shall be suitable for testing as specified in the following paragraph.

H. Air Barrier Assembly Testing: Verify air barrier assembly testing by the material Manufacturer by visiting the ABAA website to ensure a ASTM E2357 test has been completed and to obtain results. Visit the ABAA website for the reported air barrier assembly leakage rate and illustrations or CAD details which includes the methods in which the assembly test mock-ups shall be assembled.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with material Manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by material Manufacturer. Protect stored materials from direct sunlight and other sources of ultra-violet light.

C. Handle materials in accordance with Manufacturer’s recommendations.

1.7 PROJECT CONDITIONS

A. Temperature: Install fluid-applied air barrier material within range of ambient and substrate temperatures recommended by material Manufacturer. Do not apply air barrier to a damp or wet substrate.

B. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the Manufacturer.

C. Sequencing: Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.

D. Compatibility: Do not allow air barrier materials to come in contact with chemically incompatible materials.

E. Ultra-violet exposure: Do not expose air barrier materials to sunlight longer than as recommended by the material Manufacturer.

1.8 WARRANTY

A. Material Warranty: Provide Manufacturer’s standard product warranty, for a minimum 3 years from date of Substantial Completion.

B. Subcontractor (approved by ABAA and Manufacturer) Installation Warranty: Provide a two (2) year installation warranty from date of Substantial Completion, including all accessories and materials of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of attachment, loss of adhesion and failure to cure properly.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fluid Applied Membrane Air Barrier: Use regular, high temperature or low-temperature formulation depending on site conditions, within temperature ranges specified by Manufacturer. Subject to compliance with requirements, provide one of the following:

1. BASF Corporation: Enershield HP, Finestop RA, Senershield R, Acrostop R and Sonowall FT R. Thickness for products are as specified by Manufacturer. www.wallsystems.basf.com:

   a. AIR BARRIER MATERIAL PROPERTIES:

      1) Air permeance for this material has been tested and reported as being 0.0000 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.0000 cfm/ft^2 @ 1.57 psf), at 10 mils (wet) when tested in accordance with ASTM E2178 (unmodified).
      2) Water vapor permeance for this material has been tested and reported as being 1004 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (1004 ng/(Pa·s·m^2) / 17.6 US perms) at 10 mils (wet) when tested in accordance with ASTM E96 (water method – unmodified).

   b. AIR BARRIER ACCESSORY MATERIALS:

      1) Fabric Reinforcement: Sheathing fabric to be saturated with BASF Fluid-Applied Membrane for use at sheathing joints, penetrations and window rough openings.
      2) Flashing and Transition Membrane: WS Wrap polyester-faced 30-mil self-adhesive membrane.
      3) Water-based Primer for Self-Adhesive Membranes: WS Flashing Primer.
      4) Mastics: As recommended by Manufacturer.

2. Carlisle Coatings and Waterproofing: Fire-Resist Barritech VP at 60 mils thick (wet). www.carlisle-ccw.com:

   a. AIR BARRIER MATERIAL PROPERTIES:

      1) Air permeance for this material has been tested and reported as being 0.0002 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.0002 cfm/ft^2 @ 1.57 psf), at 65 mils (wet), when tested in accordance with ASTM E2178 (unmodified).
      2) Water vapor permeance for this material has been tested and reported as being 817 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (817 ng/(Pa·s·m^2) / 14.295 US perms) at 60 mils (wet) [40 mils (dry)] when tested in accordance with ASTM E96 (water method – unmodified).

   b. AIR BARRIER ACCESSORY MATERIALS:

      1) Detail Flashing: Fire-Resist 705 FR.
      2) Counter-flashing for Metal Wall Flashings: Fire-Resist 705 FR.

3) Water-Based Primer for Detail Flashing: CCW-702 WB.
4) Solvent-Based Primer for Detail Flashing: CCW-702 or CCW-702 LV.
5) Solvent-Based Aerosol Primer for Detail Flashing: CAV-GRIP.
6) Reinforcing Fabric: DCH Reinforcing Fabric.
7) Glass Mat: LiquiFiber-W.
8) Termination Mastic: SURE-SEAL Lap Sealant.
9) Fill Compound: CCW-201 or CCW-703 V.

3. DuPont Building Innovations: Tyvek Fluid Applied WB at 25 mils thick (wet), 25 mils thick (dry). www.Weatherization.Tyvek.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.0002 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.0002 cfm/ft^2 @ 1.57 psf), at 25 mils (dry), when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 1384 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (1384 ng/(Pa·s·m^2) / 24.23 US perms) at 25 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Solvent Based Primer for Flashing, Transition Strip and Detail Membranes: 3M High Strength 90; Denso Butyl (used with self-adhered membranes only).
2) Through-Wall Flashings or Shelf Angle Flashings: DuPont recommended through-wall flashing.
3) Sealants, Mastics, Adhesives and Tapes: DuPont Sealant for Tyvek Fluid Applied System; DuPont Tyvek Flashing and Joint Compound; fiberglass mesh tape.
4) Transition, Termination, and Detailing Membrane: DuPont StraightFlash, or DuPont Tyvek Flashing and Joint Compound (60mil).
5) Penetrations and Termination Sealant: DuPont Sealant for Tyvek Fluid Applied System.
6) Window Flashing Membrane: DuPont Tyvek Fluid Applied Flashing and Joint Compound, or DuPont Tyvek Fluid Applied Flashing – Brush Formulation, or DuPont StraightFlash with DuPont FlexWrap.
7) Joint Treatment: None (≤ 1/16” gaps); DuPont Tyvek Flashing and Joint Compound (≤ 1/4” gaps); DuPont Tyvek Flashing and Joint Compound w/ fiberglass mesh tape (≤ 1/2” gaps); DuPont StraightFlash (≤ 1” gaps).

4. Grace Construction Products: Perm-A-Barrier VP, 90 mils thick (wet), 45 mils thick (dry). www.na.graceconstruction.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.0004 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.0004 cfm/ft^2 @ 1.57 psf), at 69 mils (wet), when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 741.6 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (741.6

ng/(Pa·s·m^2) / 12.9 US perms) at 40 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Membrane for details and Terminations: Bituthene Liquid Membrane.
2) Water-Based Primer for Flashing, Transition Strip and Detail Membrane: Perm-A-Barrier WB Primer or Perm-A-Barrier Primer Plus.
3) Solvent-Based Primer for Flashing, Transition Strip and Detail Membrane: Bituthene Primer B-2 and Bituthene Primer B2 LVC or Bituthene Primer B2.
4) Through-Wall Flashings or Shelf Angle Flashings: Perm-A-Barrier Wall Flashing.
5) Sealants, Mastics, Adhesives and Tapes: As recommended by Grace Construction Products.
6) Transition Membrane: Perm-A-Barrier Detail Membrane, Perm-A-Barrier Aluminum Flashing and Perm-A-Barrier Wall Flashing.
7) Penetrations and Termination Sealant: Bituthene Liquid Membrane and as recommended by Grace Construction Products.
8) Window Flashing and Detail Membrane: Perm-A-Barrier Detail Membrane, Perm-A-Barrier Aluminum Flashing and Perm-A-Barrier Wall Flashing.
9) Joint Sealant: Refer to Technical Letter 1 for details on compatible waterproofing sealants.

5. Henry: Air Bloc 31 MR at 90 mils (wet). www.henry.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.00024 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.00024 cfm/ft^2 @ 1.57 psf), at 87 mils (wet) when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 2066 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (2066 ng/(Pa·s·m^2) / 36.12 US perms) at 44 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Transition Membrane: Blueskin SA and Blueskin SALT for low-temperature applications.
2) Water-Based Primer for Transition Membrane: Aquatec Primer.
3) Solvent-Based Primer for Transition Membrane: Blueskin Adhesive.
4) Solvent-Based Aerosol Primer for Transition Membrane: Blueskin Spray Prep.
5) Counter-flashing for Masonry Through-Wall Flashing: Blueskin TWF.
6) Sealant: HE 925 BES Sealant.
7) Reinforcing Tape: HE 183 Yellow Glass Fabric.
8) Mastics, Adhesives and Tapes: Henry 570-05 Polybitume.

6. Henry: Air Bloc 33 MR at 100 mils (wet), 58 mils thick (dry). www.henry.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.0016 cubic feet per minute per square foot under a pressure differential of 1.57

pounds per square foot (0.0016 cfm/ft^2 @ 1.57 psf), when tested in accordance with ASTM E 2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 652 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (652 ng/(Pa·s·m^2) / 11.4 US perms) at 59 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Transition Membrane: Blueskin SA and Blueskin SALT for low-temperature applications.
2) Water-Based Primer for Transition Membrane: Aquatec Primer.
3) Solvent-Based Primer for Transition Membrane: Blueskin Adhesive.
4) Solvent-Based Aerosol Primer for Transition Membrane: Blueskin Spray Prep.
5) Counter-flashing for Masonry Through-Wall Flashing: Blueskin TWF.
6) Sealant: HE 925 BES Sealant.
7) Reinforcing Tape: HE 183 Yellow Glass Fabric.
8) Mastics, Adhesives and Tapes: Henry 570-05 Polybitume.

7. PROSOCO, Inc.: Cat 5 at 12 - 15 mils (wet). www.prosoco.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.00018 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.00018 cfm/ft^2 @ 1.57 psf), when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 1015 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (1015 ng/(Pa·s·m^2) / 17.71 US perms) at 12 – 15 mils (wet) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Water-Based Primer: PROSOCO R-GUARD GypPrime for cut gyp board edged in rough openings.
2) Sealants: PROSOCO R-GUARD AirDam for interior perimeter seal in window installations.
3) Counter-flashing for Masonry Through-Wall Flashings: PROSOCO R-GUARD Joint and Seam Filler followed by PROSOCO R-GUARD FastFlash.
4) Through-Wall Flashings or Shelf Angle Flashings: PROSOCO R-GUARD Joint and Seam Filler followed by PROSOCO R-GUARD FastFlash.
5) Substrate Joint Treatment: PROSOCO R-GUARD Joint & Seam Filler for sheathing seams, PROSOCO R-GUARD Joint & Seam Filler covered by PROSOCO R-GUARD FastFlash in rough opening.

8. Sika Corporation: Sikagard 520 Liquid Applied Vapor Permeable Air Barrier at 30 mils (dry). www.sika.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.0014 cubic feet per minute per square foot under a pressure differential of 1.57

pounds per square foot (0.0014 cfm/ft^2 @ 1.57 psf), at 30 mils (dry) when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 720 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (720 ng/(Pa·s·m^2) / 12.6 US perms) at 30 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Water-Based Primer: Sikagard 530.
2) Solvent-Based Primer: Sikagard 510.
3) Termination Mastic: Sikaflex 11FC.
4) Sealants: Sikaflex 11FC.
5) Transition Membrane for details and terminations: SikaMultiSeal 515.
6) Reinforcing / Joint Tape: SikaMultiSeal 515.
7) Counterflashing for Masonry Through-Wall Flashings: SikaMultiSeal Plus.
8) Through-Wall Flashings or Shelf Angle Flashings: SikaMultiSeal Plus.
9) Substrate Joint Treatment: Sikaflex 11FC.

9. Sika Corporation: Sikagard 530 Liquid Applied Vapor Permeable Air Barrier at 30 mils (dry) www.sika.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being < 0.0001 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (< 0.0001 cfm/ft^2 @ 1.57 psf), at 20 mils (dry) when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 661 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (661 ng/(Pa·s·m^2) / 11.5 US perms) at 22 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Water-Based Primer: Sikagard 530.
2) Solvent-Based Primer: Sikagard 510.
3) Termination Mastic: Sikaflex 11FC.
4) Sealants: Sikaflex 11FC.
5) Transition Membrane for details and terminations: SikaMultiSeal 515.
6) Reinforcing/Joint Tape: SikaMultiSeal 515.
7) Counterflashing for Masonry Through-Wall Flashings: SikaMultiSeal Plus.
8) Through-Wall Flashings or Shelf Angle Flashings: SikaMultiSeal Plus.
9) Substrate Joint Treatment: Sikaflex 11FC.

10. STS Coatings: Wall Guardian FW-100 (Asphaltic-component) at 60 mils (wet), 30 mils (dry). www.wallguardian.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.001358 cubic feet per minute per square foot under a pressure differential of

1.57 pounds per square foot (0.001358 cfm/ft^2 @ 1.57 psf), at 30 mils (dry) / 60 mils (wet) when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 720 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (720 ng/(Pa·s·m^2) / 12.6 US perms) at 30 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Water-Based Primer for Flashing, Transition Strip and Detail Membrane: None.
2) Solvent-Based Primer for Flashing, Transition Strip and Detail Membrane: BP-40 Primer for use with UT-40 Universal Tape.
3) Through-Wall Flashings or Shelf Angle Flashings: Gorilla Flash VF-1000.
4) Mastics: None.
5) Adhesives and Tapes: Universal Tape UT-40, a butyl based tape and Great Seal LT-100, a low voc elastomeric sealant for deflection joints and details.
6) Transition Strip: Universal Tape, UT-40.
7) Termination Mastic: Great Seal LT-100.
8) Window Flashing and Detail Membrane: Universal Tape UT-40.

11. STS Coatings: Wall Guardian FW-100-A (Acrylic-based component) 40 mils (wet), 20 mils (dry). www.wallguardian.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.0001 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.0001 cfm/ft^2 @ 1.57 psf), at 20 mils (dry) when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 661 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (661 ng/(Pa·s·m^2) / 11.5 US perms) at 22 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Water-Based Primer for Flashing, Transition Strip and Detail Membrane: None.
2) Solvent-Based Primer for Flashing, Transition Strip and Detail Membrane: BP-40 Primer for use with UT-40 Universal Tape.
3) Through-Wall Flashings or Shelf Angle Flashings: Gorilla Flash VF-1000.
4) Mastics: None.
5) Adhesives and Tapes: Universal Tape UT-40, a butyl based tape and Great Seal LT-100, a low voc elastomeric sealant for deflection joints and details.
6) Transition Strip: Universal Tape, UT-40.
7) Termination Mastic: Great Seal LT-100.
8) Window Flashing and Detail Membrane: Universal Tape UT-40.

12. TK Products: TK-AirMax 2104 at 40+ mils (wet). www.tkproducts.com:

a. AIR BARRIER MATERIAL PROPERTIES:

1) Air permeance for this material has been tested and reported as being 0.0008 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.0008 cfm/ft^2 @ 1.57 psf), at 40+ mils (wet) when tested in accordance with ASTM E2178 (unmodified).
2) Water vapor permeance for this material has been tested and reported as being 1007 nanograms of water vapor passing through each square meter of area per second for each Pascal of vapor pressure differential (1007 ng/(Pa·s·m^2) / 17.6 US perms) at 14 mils (dry) when tested in accordance with ASTM E96 (water method – unmodified).

b. AIR BARRIER ACCESSORY MATERIALS:

1) Through-Wall Flashings or Shelf Angle Flashings: TK-Climate Flash, TK-Butyl Bond, TK-SS Flashing, TK-TWF-18.
2) Caulk: TK-Super Seal.
3) Adhesives and Tapes: TK-AirMax 2200 All Weather Flashing (TK Products), TK Air Max 2203 Caulk, TK-AirMax 2201 Red Sheathing Facing Tape (Venture Tape, a 3M Company), 3M All-Weather Flashing Tape 8067 (3M Company), VentureStop VB 400 (Venture Tape, a 3M Company), Venture-1585 CW-2 Red Sheating Facing Tape (Venture Tape, a 3M Company).
4) Transition Membranes: TK-Climate Flash, TK-Butyl Bond, TK-SS Flashing, TK-TWF-18.
5) Reinforcing/Joint Tape: TK-Climate Flash, TK-Butyl Bond, TK-SS Flashing, TK-TWF-18.
6) Termination of Caulk: TK-AirMax Caulk 2203 (TK Products), Manus-Bond 75AM (Manus Products, Inc.)
7) Flashing (Counter) for Masonry at Through-Wall Flashings or Transition Membranes: TK-Climate Flash, TK-Butyl Bond, TK-SS Flashing, TK-TWF-18.

2.2 AUXILIARY MATERIALS

A. Transition Membrane Between Air and Vapor Barrier Membrane and Roofing and Other Adjacent Materials: Comply with both air barrier Manufacturer's recommendations and roofing material Manufacturer's recommendations.

B. Provide primers, glass fabric scrim tape, mastic, and other materials not specifically described, but required for a complete and proper installation as instructed by the dampproofing Manufacturer or required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The ABAA Certified Air Barrier Contractor shall examine substrates, areas, and conditions under which the air barrier assembly will be installed, with ABAA Certified Installer present, for compliance with requirements.

1. Confirm site access logistics and scheduling requirements, including but not limited to use of scaffolding, lifts and staging.
2. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
3. Ensure that the following conditions are met:
   a. Surfaces are sound, dry, even, and excess mortar and / or other contaminants.

b. Inspect and confirm substrates to be smooth and without large voids or sharp protrusions. Inform General Contractor if substrates are not acceptable and need to be repaired by the concrete Subcontractor.
c. Inspect and confirm masonry joints to be reasonably flush and completely filled, and ensure all excess mortar accumulated on masonry ties has been removed. Inform General Contractor if masonry joints are not acceptable and need to be repaired by the masonry Subcontractor.
d. Masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.

4. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 and take suitable measures until substrate passes moisture test.
5. Verify sealants are compatible with membrane proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.
6. Notify Architect in writing of anticipated problems using air and vapor barrier over substrate prior to proceeding.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to material Manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

1. Ensure that penetrating work by other trades is in place and complete.
2. Prepare surfaces by brushing, scrubbing, scraping, grinding or compressed air to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the fluid-applied membrane.
3. Wipe down metal surfaces to remove release agents or other non-compatible coatings using clean sponges or with a material chemically compatible with the primary air material.

B. Prime substrate for installation of sheet membrane transition strips if recommended by material Manufacturer and as follows:

1. Prime masonry, concrete substrates with conditioning primers.
2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
3. Prime wood, metal, and painted substrates with primer.
4. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier at protrusions.

C. Prime substrate for application of sheet membrane transition strips as recommended by Manufacturer and as follows:

1. Prime masonry, concrete substrates with conditioning primer.
2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
3. Prime wood, metal, and painted substrates with primer.
4. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air and vapor barrier and at protrusions.

D. Prime substrate for installation of fluid-applied air barrier if recommended by material Manufacturer based on project conditions.

E. Protection from spray-applied materials as recommended by material Manufacturer and as follows:

1. Mask and cover adjacent areas to protect from over-spray.
2. Ensure any required foam stop or back up materials are in place to prevent over-spray and achieve complete seal.

3.3 INSTALLATION

A. Fluid Applied Membrane Air Barrier: Install air barrier accessories and fluid-applied membrane air barrier material to provide continuity throughout the building envelope in a shingle fashion. Install materials in accordance with material Manufacturer's instructions and the following (unless Manufacturer recommends other procedures in writing based on project conditions or particular requirements of their recommended materials):

1. Install veneer anchors as per air barrier Manufacturer installation sequencing.
2. Apply treatment to exterior gypsum joints and screw heads as per air barrier material Manufacturer.
3. Apply primer for transition material at the rate instructed by the air barrier material Manufacturer for 1 inch beyond terminating edge of transition membrane. Allow primer to set / cure completely before transition strip application.
4. Position subsequent sheets of transition material so that membrane overlaps the membrane sheet below by a minimum of 2 inches, unless greater overlap is recommended by the material Manufacturer. Ensure transition membrane is securely sealed onto substrate with roller.
5. Overlap horizontally adjacent pieces of transition material a minimum of 2 inches, unless greater overlap is recommended by the material Manufacturer. Roll all areas of transition strip including seams with roller.
6. Seal around all penetrations with termination mastic / sealant, membrane counterflashing or other procedure in accordance with material Manufacturer’s instructions, ensuring chemical compatibility amongst adjoining materials.
7. Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors, other intersection conditions and transitions from wet cavity to dry cavity and seal penetrations using accessory materials in accordance with the material Manufacturer’s instructions.
8. Provide transition material at changes in substrate plane (with bead of sealant / mastic, membrane counter-flashing or other material recommended by material Manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.
9. Provide mechanically fastened non-corrosive metal sheet or other Manufacturer approved transition material to span gaps greater than 1 inch in substrate plane and to make a smooth transition from one plane to the other. Transition membrane shall be installed continuously from air barrier material onto sheet metal maintaining 2 inch overlap on both edges.
10. Lap transition material over top edge of through-wall flashing and head-flashing.
11. Provide backup for the membrane to accommodate anticipated movement or use other Manufacturer approved transition material at deflection and control joints.
12. Provide transition material to joint assemblies at expansion and seismic joints.
13. Provide backup for the fluid applied air barrier to accommodate anticipated movement at deflection and control joints as recommended by material Manufacturer.
14. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and / or as otherwise recommended by the material Manufacturer.
15. Seal top edge of the self-adhered membrane to substrate with termination mastic at end of each working day.

16. Inspect installation prior to enclosing assembly and repair punctures, damaged areas and inadequately lapped seams with a patch of membrane lapped as recommended by material Manufacturer.
17. Install primer for fluid-applied air barrier if instructed by material Manufacturer.
18. Install fluid-applied membrane using equipment and methods recommended by Manufacturer to achieve a dry film thickness as required by the material Manufacturer.
19. Do not allow materials to come in contact with chemically incompatible materials.
20. Do not expose membrane to sunlight / ultraviolet light longer than as recommended by the Manufacturer.

3.4 FIELD QUALITY CONTROL

A. Owner's Inspection and Testing: Cooperate with Owner's testing agency. Allow access to work areas and staging. Notify Owner's testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted.

B. Air Barrier Association of America Installer Audits: Cooperate with ABAA's testing agency. Allow access to work areas and staging. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site audits by ABAA to verify conformance with the material Manufacturer's instructions, the site Quality Assurance Program used by ABAA, and this section of the project specification.

1. Audits and subsequent testing shall be carried out at the following rate:
   a. Up to 10,000 ft^2 of air barrier contract requires one (1) audit.
   b. 10,001 – 35,000 ft^2 of air barrier contract requires two (2) audits.
   c. 35,001 – 75,000 ft^2 of air barrier contract requires three (3) audits.
   d. 75,001 - 125,000 ft^2 of air barrier contract requires four (4) audits.
   e. 125,001 – 200,000 ft^2 of air barrier contract requires five (5) audits.
   f. 200,001 ft^2 and over of air barrier contract requires six (6) audits.
2. Forward written audit reports to the Architect within 10 working days of the inspection and test being performed.
3. If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.

3.5 PROTECTING AND CLEANING

A. Protect air barrier materials from damage during installation and the remainder of the construction period, according to material Manufacturer's written instructions.

1. Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the air barrier Manufacturer.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by Manufacturer of affected construction and acceptable to the primary material Manufacturer.

END OF SECTION

SECTION 07 41 13

PREFINISHED METAL ROOFING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, tools, equipment and services for all preformed roofing as indicated.

B. Coordinate with work of other trades.

C. It is the intent of this Section that the Work shall:
   1. conform to all applicable building code requirements and of authorities having jurisdiction;
   2. include, but not limited to:
      a. Preformed, prefinished metal roof panels
      b. Flashings
      c. Gutters, Downspouts and Splash Blocks
      d. All supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, weathertight, and complete installation.
   3. be performed by a single source contractor.

1.2 RELATED WORK

A. Division 5 Sections as required; generally: structural steel, steel joists, and miscellaneous metals.

B. Section 06 10 00 - Rough Carpentry

C. Section 07 62 00 - Sheet Metal Flashing, Gutters, Downspouts and Trim

D. Divisions 22, 23 and 26: All Sections of Work relating to or affecting the roofing system, including mechanical, plumbing and electrical items penetrating roofing system.

1.3 REFERENCES

A. American Institute of Steel Construction (AISC)
   1. Manual of Steel Construction

B. American Iron and Steel Institute (AISI)
   1. Cold Formed Steel Design Manual

C. ASTM International (ASTM)

D. A792, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

E. E108, Standard Test Methods for Fire Tests of Roof Coverings

F. E283, Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

G. E331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

H. E1514, Standard Specification for Structural Standing Seam Steel Roof Panel Systems

I. E1592, Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

J. Factory Mutual Research Corporation (FM) (FMRC)
Class 1-90 Windstorm Rating
Class 1-SH (Test 4471) Hail Damage Rating

K. International Conference of Building Officials (ICBO)
ICBO Evaluation Services, Inc. Report No. ER-5409

L. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
1. Architectural Sheet Metal Manual

M. ASCE-7 Wind uplifts requirements for geographical area.

N. International Building Code

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
1. Manufacturer must have a minimum of three (3) years experience manufacturing roof panels of the type specified for this Project. Panels specified in this Section shall be produced in a factory environment or by manufacturer’s certified and approved on-site roll forming equipment to assure the highest level of quality control. A letter certifying compliance should accompany the product material submittal.

B. Installer’s Qualifications:
1. Installer of the system shall be an approved installer, certified and authorized by the manufacturer as trained and qualified to install the manufacturer's product. Provide a letter of certification from manufacturer that installer has a minimum of three (3) year of metal roof panel installation experience preceding the date upon which work is to commence.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Testing:
1. All panels must be FM Class 1-90 Windstorm Rating tested. Roofing system shall be installed in accordance with ASCE-7 wind uplift requirements for geographical location and a 140 MPH 3-second gust wind speed zone, Exposure B with an importance factor of 1.15 based on IBC requirements.
a. Zone 1 Field -43.2
b. Zone 2 Perimeter -72.4
c. Zone 3 Corner -108.8
2. Panel system shall have an FM Hail Damage Rating of Class 1-SH (Test 4471).
3. Panel system shall have a Class “A” Fire Rating in accordance with ASTM E108.

4. Metal roof system must be installed to resist the roof design pressures calculated in accordance with IBC or authorities having jurisdiction. Determine panel bending and clip-to-clip strength by testing in accordance with ASTM E1592. Capacity for gauge, span or loading other than those tested may be determined by interpolating test results by engineer supplying calculations.
5. Metal roof system must meet the air infiltration requirements of ASTM E283 when tested with a 6.24 PSF pressure differential with resulting air infiltration of 0.0071 cfm/sq. ft.
6. Metal roof system must meet the water penetration requirements of ASTM E331 when tested with a 12.00 PSF pressure differential with no uncontrollable water leakage when five (5) gallons per hour of water is sprayed per square foot of roof area.
7. ICBO Evaluation Services, Inc. Report No. ER-5409 is in compliance with UBC authorities having jurisdiction.

1.6 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer's installation instructions.

B. Shop Drawings: Include layouts of panels, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashing, closures and special details. Distinguish between factory and field assembly work.

C. Calculations: All calculations shall be sealed by a professional engineer licensed in the State of Texas. Engineering calculations defining cladding loads on all roof areas based on specified building codes, allowable clip loads and required number of fasteners to secure the panel clips to the designated substructure. Uplift loads on clip fasteners with full recognition of prying forces and eccentric clip loading. Calculate holding strength of fasteners in accordance with submitted test data provided by fastener manufacturer based on length of embedment and properties of materials.

D. Samples:
Color charts or samples from a minimum of 18 colors of manufacturer’s Kynar 500® or Hylar 5000® finishes for Architect’s selection.
One (1) foot long sample of coated panel, including clips and fasteners.

E. Certifications:
1. Letter of certification from manufacturer that installer is in compliance and meets specified requirements.
2. Letter of certification from manufacturer that panels have been produced in a factory environment or with certified/approved fixed-base roll forming and leveler equipment.
3. Certified test results by a recognized testing laboratory or manufacturer’s laboratory (witnessed by a professional engineer) in accordance with specified performance test methods for each panel system.
4. Manufacturer’s affidavit that materials used in Project contain no asbestos.

F. Testing Reports: Showing metal panels have been tested in accordance with specified performance testing requirements.

G. Warranty: Manufacturer’s warranty as specified.

1.7 INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

1.8 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver metal roof system to job site properly packaged to provide protection against transportation damage.

B. Handling: Exercise extreme care in unloading, storing and erecting metal roof system to prevent bending, warping, twisting and surface damage.

C. Storage:
1. Store all materials and accessories above ground on well skidded platforms.
2. Store under waterproof covering.
3. Provide proper ventilation of metal roof system to prevent condensation build-up between each panel or trim / flashing component.

1.9 WARRANTY

A. Warrant the work specified herein against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials or workmanship. Warranty shall be a “Weather tightness” Warranty. Field Reports are required throughout Project and are to be supplied by a Manufacturer’s Approved Technical Inspector. Manufacturer’s personnel which are not Quality Control Technicians are not acceptable for inspection.
1. Roof Panels and Finish:
   a. Durability of the roof panels due to rupture, structural failure or perforation shall be warranted for a period of 20 years by the Manufacturer.
   b. The exterior color finish for painted roof panels shall be warranted by the Manufacturer for 20 years against chalking, blistering, peeling, cracking, flaking, checking and chipping.
2. Weathertightness:
   a. The entire roof system including all roof panels, flashings, curbs, interior gutters, etc. shall be warranted by the manufacturer against leaks for a period of 20 years.
   b. The warranty shall be issued to the Owner by the Manufacturer at time of entire Project Substantial Completion.
   c. The warranty shall guarantee the entire roof system and associated work against defective materials and workmanship of installation.
   d. The roof system shall include roof insulation, flashing, metal work, labor, and material shall be guaranteed against failure of workmanship and materials. Repair of the system by the manufacturer, including materials and labor, shall be done at no cost to the Owner for duration of warranty period.
3. Roofing Contractor: Jointly with any subcontractors employed by him, shall guarantee the work required and performed under this contract will be free from defects in workmanship and materials, and that the building will be and remain waterproof for a five (5) year warranty period, after the Architect accepts the work as substantially complete. The warranty shall be in approved notarized written form, to obligate the Contractor, and subcontractors, to make good the requirements of the warranty. The warranty will be held jointly with the Bonding Company for the first two (2) years and the manufacturer for the remaining three (3) years.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers listed who produce products equivalent to those specified are approved for use on the Project. Other manufacturers must have a minimum of ten (10) years experience manufacturing equivalent products to those specified and comply with requirements of Division 1 regarding substitutions to be considered.
   1. AEP-Span, Dallas, TX; (214) 827-1740
   2. Firestone Unaclad UC-6 Double-Lock Standing Seam
   3. Fabral, Grapevine, TX; (800) 477-9066
   4. MBCI, Houston, TX; (281) 445-8555
   5. CARLISLE SYNTEC INCORPORATED Carlisle, PA 800-479-6832
   6. Pac Clad , Tyler Texas 1-800-441-8661
   7. Berridge Manufacturing Company; San Antonio, TX; (800) 669-0009
   8. McELROY METAL Bossier City, LA 800-950-6531
   9. RollCOM, a Centria Company, Frankfort, KY; (888) 647-4084
   10. UNA-CLAD Anoka Minnesota 800-426-7737

B. Specifications are based on SuperLok® (Double Lock Seam) architectural structural standing seam metal roof system manufactured by MBCI, Houston, TX; (281) 445-8555.

C. Roof panels with lap type side joints or those requiring battens or other non-integral sealing means or exposed structural fasteners will not be acceptable.

D. Roof panels shall be roll formed in the manufacturer's plant to control quality or by certified/calibrated/approved on-site roll-forming equipment only.

E. Roof panels shall have a 20 year foamable mastic sealant plant-installed sealant for quality control. No solid butyl sealant or extruded rubber will be accepted.

2.2 MATERIALS

A. Metal Roof Panels:
   1. Panel Profile: Two (2) inch high or Three (3) inch high (at Press Box Roof) by 3/4 inch wide rib by 16 inch wide, striated panel.
   2. Metal Roof System: Vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations, with factory applied hot-melt mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.
   3. Gauge: Minimum 24 gauge (UL 90 rated)
   4. Substrate: Galvalume® steel sheet, Grade “D” minimum yield of 50,000 PSI.
   5. Clips: Two (2) piece floating clip, 18 gauge base, 24 gauge top, with factory applied mastic, with fasteners to structural.
   6. Texture: Striations.
   7. Finish: Full strength Kynar 500 or Hylar 5000 Fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to tests for adhesion, flexibility, and longevity as specified by the Kynar 500 or Hylar 5000 finish supplier. Color shall be selected by Architect from manufacturer’s full range of non-metallic colors. (20 year warranty)

8. Touch-up Paint: Paint burns, scars, welds, and damaged and rusted surfaces with cold galvanizing paint in accordance with ASTM A780. Acceptable Products include ZRC Cold Galvanizing Compound manufactured by ZRC Chemical Products, Quincy, MA; Galvax Zinc-rich Cold Galvanizing Coating manufactured by Alvin Products, Inc., Lawerence, MA; or paint complying with military specification MILP-21035A, Type I or II.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: All self-tapping/self-drilling fasteners, bolts, nuts, self-locking rivets and other suitable fasteners shall be designed to withstand specified design loads.
1. Use long life fasteners for all exposed fastener applications.
2. Provide fasteners with a factory applied coating in a color to match metal roof system application.
3. Provide neoprene washers under heads of exposed fasteners.
4. Locate and space all exposed fasteners in a true vertical and horizontal alignment. Use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.
5. Fasteners used to attach metal “Z” purlins shall be size and type recommended by manufacturer to achieve FM 1-90 requirements.

B. Accessories:
1. General: Provide all components required in accordance with the metal roof system manufacturer’s approved shop drawings for a complete metal roof system to include panels, panel clips, trim/flashing, fascias, ridge, closures, sealants, fillers, and other required items.
2. Utility Board: Shall be 1/2 inch thick glass mat-embedded, water resistant gypsum core panel conforming to “Dens-Deck Primed” roof board as manufactured by G-P Gypsum Corporation or Architect approved equal.
3. Insulation Board: Three (3) inch thick closed cell glass reinforced polyisocyanurate insulation board complying with ASTM C1289, Type I, Class 2 and FS HH-I-1972/1, Class 2.
4. Waterproofing Membrane: 60 mil thick SBS modified bituminous product of self-adhering type with non-stick surface conforming to “TAMKO TW-Metal and Tile Underlayment” manufactured by Tamko Roofing Products, Inc. or Architect approved equal.
5. Prefabricated Roof Curbs and Equipment Supports, Roof Jacks, and Rooftop Walkways: Shall be product of manufacturer approved by the metal roof system manufacturer and as specified below. Curbs shall be type recommended by roofing manufacturer to warranty curb and roofing for 20 years.
6. Closures: All outside closures shall be fabricated from Galvalume® sheet steel of the same gauge, finish and color as the panels. Galvanized base is unacceptable.
7. Tape Seal: Shall be a pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape seal approved by the metal roof system manufacturer.
8. Joint Sealant: Shall be a one-part elastomeric polyurethane sealant approved by the metal roof system manufacturer.
9. Splash Blocks: Shall be as specified in Section 07 62 00, Sheet Metal Flashing, Gutters, Downspouts and Trim.

2.4 FABRICATION

A. Material shall be in-line tension leveled prior to roll forming panel profile.

B. Roll form panels in continuous lengths, full length of detailed runs.

C. Standard panel length shall be 45 feet, unless approved by the metal roof system manufacturer.

D. Fabricate trim/flashing and accessories to detailed profiles.

E. Fabricate trim/flashing from same material as panel.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.

B. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions. This specifically includes verifying the secondary structurals and/or decking are installed to meet building code requirements. Coordinate with metal roof system manufacturer to insure that reduced clip spacings at eave, rake, ridge and corner areas are accommodated. Supply calculations, sealed by a professional engineer licensed in the State of Texas, showing required clip spacings.

C. Discrepancies:
1. Bring discrepancies to the attention of the Architect.
2. Do not proceed with installation until discrepancies have been resolved.

3.2 INSTALLATION OF METAL ROOFING OVER METAL DECK

A. Install metal deck to structure to meet ASCE-7 wind uplift requirements.

B. If shown or required, install insulation over metal deck in conformance with approved shop drawings and manufacturer's instructions.

C. If shown or required, install substrate board over insulation in conformance with approved shop drawings and manufacturer's instructions.

D. If shown or required, install waterproofing membrane barrier over substrate board in conformance with approved shop drawings and manufacturer's instructions. Lap and tape seal all joints.

E. Remove protective strippable plastic film covering from metal roof panels, trim, and related items in accordance with manufacturer's instructions.

F. Install metal roof system so that it is weathertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction. Isolate dissimilar metal contact with proper taping and / or coatings.

G. Install metal roof panels, trim, and related items in accordance with approved samples with approved shop drawings and manufacturer's instructions.

H. Provide concealed anchors at all panel attachment locations.

I. Install panels plumb, level and straight with seams and ribs parallel, conforming to design as indicated.

J. Install roof jacks in accordance with approved shop drawings and manufacturer's instructions.

K. Install roof curbs in accordance with approved shop drawings and manufacturer's instructions. Anchor curbs securely in place with provisions for thermal and structural movement. Provide prefinished metal cover around all curbs to match color and finish of metal roof panels.

L. Install gutters and downspouts in accordance with approved samples with approved shop drawings and manufacturer's instructions. Gutter design for required gutter and downspout sizes shall be submitted prior to installation.

M. Install downspouts plumb and level, attached to columns or wall with straps located at top and bottom of downspout and maximum ten (10) feet on center.

N. Install splash block under discharge port of downspouts.

O. Install gutter screen over installed gutter. Secure screen to spacer with self-tapping screw.

P. Provide expansion joints on ends of gutters spaced maximum 50 feet on center. Install snap-on cover over expansion joint.

3.3 CLEANING AND PROTECTION

A. Remove scraps and debris and leave work area clean.

B. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. Paint areas where finish is damaged on prefinished metal by painting with a compatible paint in color to match undamaged finish.

C. Clean other work damaged or soiled by Work of this Section.

D. Protect finished work from damage.

3.4 INSPECTION

A. Architect and Contractor reserve the right to inspect the work during application. Upon completion of the work, if inspection discloses that roofing is not according to specifications or has been damaged, Contractor agrees to furnish additional materials necessary to make repairs and place work in an acceptable condition at no additional expense to Owner.

END OF SECTION

SECTION 07 42 13

METAL WALL AND SOFFIT PANELS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable to this Section.

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 41 13 – Prefinished Metal Roofing

B. Section 07 54 19 – Fully Adhered Thermoplastic Membrane “Hybrid” Roofing System

C. Section 07 62 00 – Sheet Metal Flashing and Trim

D. Section 07 92 00 - Joint Sealants

1.2 DELIVERY AND STORAGE

A. All panels shall be delivered with appropriate packaging to provide protection against transportation damage. Materials damaged in shipping or storage shall not be used.

B. Store all materials and accessories above ground on well-skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up between panels.

1.3 COORDINATION

A. Coordinate work with installation of associated metal flashings and manufactured roof panels.

1.4 WARRANTY

A. Provide a five (5) year contractors workmanship and water tightness warranty.

B. Provide a manufacturer’s twenty (20) year finish warranty.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Metal Wall Panels: Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with requirements of Division 1 regarding substitutions to be considered.
   1. AEP-Span, Dallas, TX; (214) 827-1740
   2. Architectural Building Components, Inc., Houston, TX; (800) 423-1105
   3. Berridge Manufacturing Co., Houston, TX; (800) 231-8127
   4. MBCI, Houston, TX; (281) 445-8555
   5. Petersen Aluminum Corporation (PAC-CLAD), Tyler, TX; (800) 441-8661

B. Specifications are based on “HR-16” panel as manufactured by Berridge Manufacturing Co.

2.1 MATERIALS

A. Wall Siding Panels: 24 ga. Galvalume metal.

B. Style: One (1) inch thick Flush panel with minimum width of 11” and maximum width of 12 inches.

C. Finish: Embossed, factory-prefinished with an exterior surface of Kynar 500® or Hylar 500® based coating having a resin content consisting of at least 70 percent PVDF fluoropolymer resin content, in at least 1.0 mil thickness, in color(s) as selected by Owner; interior surface finish, manufacturer’s standard.

D. Soffit Panels: Vented thickness as recommended by Manufacturer of wall panels, aluminum. Manufacturer shall be the same as wall panel manufacturer. Specifications are based on “FW-12” panel as manufactured by Berridge Manufacturing Co.

E. Accessories:
1. Sub-Girts: 18 gauge minimum thickness galvanized steel, 3/4 inch rise minimum, or as required to align with existing conditions.
2. Sub-Girt Fasteners: Stainless Steel screws to meet application.
3. Concealed Fasteners: Stainless Steel screws supplied or recommended by panel manufacturer to suitapplication.
4. Metal Trim at Siding Panels: 24 ga. galvanized metal matching finish type and color of siding panels.
5. Closures: 24 ga. galvanized metal pre-finished finish.
6. Separate dissimilar metals with asphalt-saturated building felt or a bituminous coating to prevent galvanic action.
7. Waterproofing Membrane: 40 mil thick fully adhered high temperature (TAMKO HT TW-40 or approved equal); provide with primers, adhesives and accessories as recommended by manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine metal frame to insure it is prepared to receive siding.

B. Ensure substrates are flat, free from objectionable warp, wave and buckle

3.2 INSTALLATION OF SIDING PANELS

A. Install sub-girts at maximum 24 inches on center (vertical max.) to satisfy local building code, at least three per panel length. Fasten girts to wall with two fasteners at 18 inches on center max.

B. Comply with manufacturer’s instructions for assembly, installation and erection in order to achieve weathertight installation.

C. Install waterproof membrane behind sub-girts for unvented panels only. Seal all laps.

D. Fasten siding panels along each sub-girt.

E. Install closures and trim to form a complete installation.

F. Install sheet metal flashings according to provisions of Section 07 62 00.

3.3 PROTECTION

A. Protect roofing and siding from damage and discoloration.

B. Repair damaged or discolored panels.

END OF SECTION

SECTION 07 62 00

ROOF RELATED SHEET METAL

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable to this Section.

PART I - GENERAL

1.1 SECTION INCLUDES

A. It is the intent of this Section that the Work shall:
1. conform to all applicable building code requirements and of authorities having jurisdiction;
2. include all shop and field formed sheet metal work shown on drawings, specified or required, including, but not limited to:
   a. Roof penetration sleeves and hood and umbrella counterflashing
   b. Metal counterflashing
   c. Expansion joint
   d. Roof drains
   e. Scuppers
   f. Metal perimeter edge
   g. Gutters, Downspouts, Splash Blocks and Splash Pans
   h. One-way roof moisture relief vents
   i. Metal gravity vents
   j. Metal heat exhaust vents
   k. Sanitary vent pipes
   l. Pipe box
   m. Copings, trim and miscellaneous sheet metal accessories.
3. be part of the Work of Section 07 52 19, Modified Bitumen Membrane Roofing System; and
4. be performed by a single source contractor.

1.2 RELATED WORK

A. Section 07 41 13 – Prefinished Metal Roofing

B. Section 07 54 19 – Fully Adhered Thermoplastic Membrane “Hybrid” Roofing System

C. Section 07 72 00 - Roof Accessories

D. All Sections of Work relating to or affecting the roofing system, including mechanical, plumbing and electrical items.

1.3 REFERENCES

A. ASTM International (ASTM)
1. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
2. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
3. B32, Standard Specification for Solder Metal
4. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

B. FM Global (FM)
   1. Loss Prevention Data Sheets: I-49, Perimeter Flashing

C. Federal Specifications (FS)
   1. QQ-L-201

D. National Association of Architectural Metal Manufacturers (NAAMM)

E. National Roofing Contractors Association (NRCA)
   1. Roofing and Waterproofing Manual

F. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
   1. Architectural Sheet Metal Manual

G. ANSI / SPRI ES-1: Fabricate and install sheet metal edge flashings and copings to comply with requirements of ANSI/SPRI ES-1 for 140 MPH wind speed zone and wind resistance loads.

1.4 SUBMITTALS

A. Product Data:
   1. Manufacturer’s specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer’s installation instructions.

B. Shop Drawings: Indicating sizes, configurations, details of attachment to related and adjacent work, materials, and finishes.

C. Samples:
   1. Full range of finish colors for Architect's selection.
   2. 12 inch long sample of each specified item with approved finish.
   3. Provide full size mockup of all shop built assemblies.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Fabricator and installer of roof-related flashing and accessories shall be the same as the membrane roof installer.

B. Comply with governing codes and regulations of authorities having jurisdiction.

C. ANSI / SPRI ES-1: Fabricate and install sheet metal edge flashings and copings to comply with requirements of ANSI/SPRI ES-1 for 140 MPH wind speed zone and wind resistance loads.

1.6 INSTALLATION CONFERENCE

A. Refer to Section 01 31 13, Project Coordination.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, handle and store materials in accordance with manufacturer's instructions.

B. Handle and store materials and equipment in such a manner as to avoid damage.

C. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day. Any exception must be in written form. Do not place materials or equipment in such a manner as to overload structure.

1.8 WARRANTIES

A. Manufacturer's Product Warranty:
1. Manufacturer's standard 20 year Kynar 500 or Hylar 5000 Finish warranty signed by the manufacturer, with guarantee covering any failure of the fluoropolymer finish during the warranty period.
2. Failure is defined to include, but not be limited to:
a. Deterioration of finish, such as fading, discoloring, peeling, cracking, corroding, etc.
3. Correction may include repair or replacement of failed product.

B. Roofing Contractor’s Warranty:
1. Contractor shall warrant the sheet metal work and related work to be free from defects in workmanship and materials, and that the metal flashings will be and remain watertight, for a period of five (5) years from date of Substantial Completion.
2. Defects shall include, but not be limited to:
a. Leaking water or bitumen within building or construction.
b. Becoming loose from substrate.
c. Loose or missing parts.
d. Finish failure as defined above.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers named within specification are approved for use on the Project providing:
1. their products meet or exceed the specifications;
2. company has a minimum of five (5) years experience manufacturing products of the type specified;
3. products have been tested in conjunction with roofing membrane system as an assembly and as such has obtained the same approval and rating as the roofing membrane system; and
4. products are approved for use by the roofing membrane manufacturer.

B. Substitutions shall be in accordance with Division 1 requirements regarding substitutions.

2.2 SHEET METAL MATERIALS

A. General Requirements: Roofing sheet metal system shall have been tested in conjunction with roofing membrane system as an assembly and have the same approval and rating as the roofing membrane system.

B. Prefinished Galvalume Sheet Steel:
1. Commercial quality with 0.20 percent copper, conforming to ASTM A526, except ASTM A527 for lock forming, with G-90 hot-dip galvanized coating designation.
2. Thickness: Except as otherwise indicated, minimum 24 gauge. SMACNA recommendations shall govern.
3. Finish: Kynar 500 or Hylar 5000 in color as selected by Architect from manufacturer's standard colors.

C. Membrane Clad Galvanized Sheet Steel:
1. Commercial quality with 0.20 percent copper, conforming to ASTM A526, except ASTM A527 for lock forming, with G-90 hot-dip galvanized coating designation.
2. Thickness: Except as otherwise indicated, minimum 24 gauge. SMACNA recommendations shall govern.
3. Finish: PVC coating as per Membrane Manufacturer's requirements.

D. Sheet Lead:
1. Comply with FS QQ-L-201, Grade B
a. Four (4) pound minimum for use at roof drains and soil stacks.

E. Stainless Steel: ASTM A167, Type 302 / 304 Soft Temper, No. 2D finish. Minimum thickness 24 gauge, except as otherwise noted.

2.3 FASTENERS

A. Same metal as flashing / sheet metal or other non-corrosive metal or as noted below.

B. Exposed fasteners shall be self-sealing and gasketed for weathertight installation. (ZAC type)

C. Match finish of exposed heads with material being fastened.

D. Mechanical Fasteners:
1. Nails: Ring shank, minimum 1-1/2 inches in length with 1/2 inch diameter head.
2. Washers: Steel washers with bonded rubber sealing gasket.
3. Screws: Self-tapping sheet metal type of stainless steel or compatible with material being fastened, with hooded integral EPDM washers (ZAC type).
4. Rivets: Stainless steel and cadmium plated material, closed end type of sizes recommended by sheet metal manufacturer to suit application.

E. Clips:
1. Continuous Cleat (coping / fascia): Minimum 20 gauge, G-90 galvanized, stainless steel, or aluminum. Match material of coping/fascia and provide one (1) gauge heavier.

2.4 RELATED MATERIALS

A. Solder: ASTM B32, alloy grade 58, 50 percent tin, 50 percent lead.

B. Flux:
1. Phosphoric acid type, manufacturer's standard.
a. For Use with Steel or Copper: Rosin flux
b. For Use with Stainless Steel: Acid-chloride type flux, except use rosin flux over tinned surfaces.

C. Underlayment:
1. 48 mil minimum, non-reinforced, homogeneous, waterproof, impermeable elastomeric sheeting manufactured by Nervastral, Inc. or Lexsuco.

D. Adhesives: Type recommended by flashing sheet manufacturer seaming and adhesive application of flashing sheet to ensure adhesion and watertightness.

E. Metal Accessories: Sheet metal clips, straps, anchoring devices, clamps and similar accessories required for the complete installation of work, matching or compatible with

material being installed, non-corrosive, size and gauge recommended by installer to suit application and performance.

F. Sealant:
1. Type A:
a. Type: One-part, non-sag, moisture-curing polyurethane sealant.
b. Approved Products / Manufacturers: “Chem-Calk 900” manufactured by Bostik Construction Products Division, “Vulkem 921” manufactured by Mameco International, Inc., “Dynatrol I” manufactured by Pecora Corporation, “NP 1” manufactured by Sonneborn Building Products, or approved equal.
2. Type B:
a. Type: One-part, neutral-curing, medium-modulus silicone sealant for sealing metal to metal surfaces, i.e. metal edge, cover plates, etc.
b. Approved Products / Manufacturers: “Chem-Calk 1200” manufactured by Bostik Construction Products Division, ”795 Silicone Building Sealant” manufactured by Dow Corning Corporation, “895 Silicone” manufactured by Pecora Corporation, “Omniseal” manufactured by Sonneborn Building Products, “Spectrem 2” manufactured by Tremco Incorporated, or approved equal.

G. Grout - Pitch Pans:
1. Type: Quick-setting, non-shrink, non-metallic, high strength formula complying with ASTM C1107.
2. Approved Products / Manufacturers: “Sure Grip High Performance Grout” manufactured by Dayton Superior Corporation, “Premier Quick-Trim” manufactured by L & M Construction Chemicals, Inc., “Masterflow” manufactured by Master Builders, Inc., “Sonnogrout 10K” manufactured by Sonneborn Building Products, or approved equal.

H. Pitch Pan Filler:
1. Type: Pourable polyurethane sealer, approved by roofing system manufacturer.
2. Approved Products / Manufacturers: “Quick Pitch Sealer” manufactured by U.S. Intec, “SPM Pourable Sealer” manufactured by Johns Manville, or approved equal.

I. Termination Bar:
1. Material: Extruded aluminum bar with flat profile.
2. Size: 1/8 inch thick by one (1) inch wide with factory punched 1/4 inch x 3/8 inch oval holes spaced six (6) inches on center.
3. Approved Product / Manufacturer: “TB 125” manufactured by TruFast Corp., or approved equal.

J. Pipe Hangers and Supports: Refer to Section 07721, Roof Accessories.

K. Splash Blocks: Concrete type, of size and profiles indicated; minimum 3,000 psi compressive strength at 28 days, with minimum five (5) percent air entrainment. Use at locations where roof drainage discharges on ground.

L. Splash Pans: 22 gauge stainless steel, of size and profiles indicated. Use at locations where roof drainage discharges over adjoining, lower roof level(s).

2.5 FABRICATION

A. Except as otherwise indicated, fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and reviewed shop drawings. Form all flashings, receivers and counterflashings in accordance with standards set forth in the NRCA roofing manual and SMACNA.

B. Comply with manufacturer's installation instructions and recommendations.

C. Unless noted otherwise, fabricate perimeter edge/fascia, scuppers, gutters, downspouts, copings, counterflashings, wind clips, and trim from pre-finished galvanized sheet steel.

D. Shop fabricate work to greatest extent possible. Fabricate inside and outside corners for metal edges, counterflashing, and coping caps.

E. Fabricate items to size and dimensions as indicated on the drawings. Limit single-piece lengths to ten (10) feet.

F. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work sufficient to permanently prevent leakage, damage or deterioration of the work.

G. Integrate flashing in a manner consistent with detailing. Form work to fit substrates.

H. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.

I. Fabricate items with straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.

J. Fold back edges on concealed side of exposed edge to form hem.

K. Unless noted otherwise, lap joints minimum three (3) inch. Lap joints to have sealant installed as per details, to maintain watertight condition, inside and outside corners and elevation changes to be riveted and soldered.

L. Seams:
   1. Wherever possible, fabricate non-moving seams in sheet metal with flat-lock seams and end joints.
   2. Pre-finished Galvanized Steel: Seal pre-finished metal seams with rivets and silicone sealant.
   3. Metal Other than Aluminum: Tin edges to be seamed, form seams, and solder.

M. On Kynar 500 or Hylar 5000 pre-finished metal, surface sand metal flanges prior to applying any primers. Prime all metal in contact with bituminous material.

N. Backpaint all concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals.

O. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than one (1) inch deep filled with mastic sealant concealed within joints.

2.6 FABRICATED ITEMS

A. Metal Flashings: (Minimum ten (10') foot lengths)
   1. Through wall Receiver Tray: Minimum 24 gauge stainless steel, through wall receivers shall not extend past the face of the exterior veneer more than ¾".
   2. Counterflashings: Minimum 24 gauge stainless steel formed in maximum ten (10) foot lengths. Through-wall receivers shall be 24 gauge stainless steel, through wall receivers shall not extend past the face of the exterior veneer more than ¾".

B. Wind Clips: Minimum 24 gauge stainless steel (or match material of counterflashing), one (1) inch wide by length to engage counterflashing a minimum of 1/2 inch.

C. Roof Penetrations:
   1. Umbrella Counterflashing: Two-piece construction of minimum 22 gauge stainless steel, fabricated in accordance with drawings or project requirements.
   2. Flashing Pans:
      a. 24 gauge stainless steel.
      b. Fabricate to provide installed minimum clear inside perimeter dimension of two (2) inches on each side of penetrating element.
      c. Fabricate pans to at least six (6) inches above the finished roof membrane and with 1/4 inch hem at top edge and with four (4) inch flanges. Round all corners of flange.
      d. Fabricate metal bonnets for all pans, NO EXCEPTIONS. Fabricate bonnets with metal compatible with metal to which bonnet is to be attached. On beams and other steel, weld in place bonnets fabricated from 1/4 inch steel plate. Draw band bonnets fabricated from 22 gauge stainless steel may be used on circular projections.

D. Metal Edge:
   1. Pre-finished metal formed in maximum ten (10) foot lengths, with six (6) inch wide cover plates of same profile, four (4) inch flange, maximum seven (7) inch fascia, 3/4 inch gravel stop.
   2. Provide expansion slip joints at maximum 20 feet on center.
   3. Shop fabricate all interior and exterior corners. Fabricate exterior corners with 18 inch minimum to four (4) foot maximum legs. Lap, rivet, and seal prior to delivery to jobsite.
   4. Fabricate to sizes and dimensions as indicated on drawings with a minimum one (1) inch coverage past top of wall. Refer to SMACNA Fig. 2-5A.
   5. Provide mock-up for Architect's approval prior to fabrication.

E. Continuous Cleats: Continuous strips, same material and profile, minimum one gauge heavier of item which cleats attach.

F. Vent Hoods, Sleeves, Penetration Flashings, and Accessories: Minimum 24 gauge stainless steel, or as shown or directed otherwise.

G. Angle Termination Bar: Aluminum pressure bar 1/8 inch x one (1) inch.

H. Vent Pipe Flashing: Four (4) pound lead. Provide proper size to fold down inside of pipe a minimum of one (1) inch.

I. Gutters / Downspouts / Collector Heads:
1. Pre-finished metal formed in maximum ten (10) foot lengths, with six (6) inch wide cover plates.
2. Match dimension of existing. Verify gutter and downspout meets rainfall data as outlined in SMACNA.
3. End Caps, Downspout Outlets, Gutter and Downspout Straps, Support Brackets and joint fasteners to be manufactured to suit profile and dimension of gutter and downspout.
4. Install all anchoring devices as outlined in SMACNA.
5. Expansion Joints: Lap or Butt type per SMACNA, locate every 50 linear feet.
6. Gutter Straps and Supports: Pre-finished metal (match color) hemmed around 1/8 inch galvanized bent steel bracket.
7. Downspout straps: Strap type, like metal, match color.
8. Gutter Screen: Stainless steel 1/4 inch diamond wire screen enclosed in a pre-finished steel frame.
9. Collect Heads: Pre-finished metal (match color). As outlined in SMACNA; Refer to Figure 1-25F and Figure 1-28 with alternate Section A-A.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrates are smooth and clean to extent required to perform sheet metal work.

B. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set in place.

C. Verify that reglets, nailers, cants, and blocking to receive sheet metal are in place and free of concrete and soil.

D. Do not start work until conditions are satisfactory.

3.2 PREPARATION

A. Field measure site conditions prior to fabrication work.

B. Install starter and edge strips and cleats before starting installation.

3.3 INSTALLATION

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form 1/4 inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Pre-fabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than three (3) feet from actual corner. Laps shall be one (1) inch, riveted and soldered at following locations:
1. Pre-fabricated corners;
2. transitions;
3. changes in direction, elevation, and plane; and
4. at intersections.

B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners wherever

possible; and set units true to line and level as indicated. Install work with laps, joints, and seams which are permanently watertight and weatherproof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

D. Separations: Provide for separation of metal from dissimilar metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations of contact as recommended by manufacturer or fabricator. Do not use materials which are incompatible with roofing system.

E. Continuous Cleat: At exposed edges of perimeter edge, fascias, cap flashings, and where required, attach continuous cleat at six (6) inches on center with appropriate fasteners. At a distance of 10 feet from each direction of all corners, install fasteners spaced at 3 inches on center. Install cleat so fascia extends a minimum of 1 inch below top of exterior wall finish.

F. Gravel Guard / Fascia:
1. Install with expansion joints 10 feet o.c., 1/2 inch expansion leeway, with cover plate.
2. Set in asphalt mastic and fasten into nailer at 3 inches o.c. staggered.
3. Strip in flange with specified stripping plies extending 6 inches from the outer edge of the flange and butt base of gravel stop.

G. Counterflashing:
1. Do not use surface mount counterflashing except as noted in drawings.
2. Set in through wall with receiver and spring lock counterflashing, as detailed in drawings and to NRCA roofing manual, SMACNA standards.
3. Coordinate installation of through-wall flashing with the masonry contractor.
4. Seal through-wall in conjunction with masonry wall waterproofing.
5. Install wind clips 30 inches o.c. at all counterflashing over five (5) feet in length.

H. Pitch Pans, Metal Flanges:
1. Apply mastic under pitch pan or metal flashing flange at least 1/2 pound per linear foot.
2. Prime all metal flanges with asphalt primer prior to flashing installation.
3. Clean all projections enclosed in pitch pans in any manner suitable and coated with a rust inhibitive coating as approved by the Architect. Coating shall be allowed to dry prior to pitch pan fill.
4. Fill base of pitch pans with grout or cementitious binder and allow to cure.
5. Top Finish Fill: Self-leveling, one-part urethane; at least two (2) inches to top of pitch pan sides.
6. Strip in pitch pan flanges with two strips of specified stripping plies set in hot bitumen extending three (3) inches from the outer edge of the flange to at least three (3) inches inward toward base of pitch pan. Provide finish stripping ply of SBS modified bitumen membrane in hot bitumen extending six (6) inches from the outer edge of the flange and butt to base of pitch pan.

I. Sanitary Vent Stacks:
1. Prime top and bottom flanges of lead flashing sleeve. Set flange in uniform troweling of plastic roof cement. Prime top side of flange to receive strip-in membrane.
2. Fold lead sleeve down inside of pipe a minimum of one (1) inch. Apply a continuous bead of sealant on inside of pipe prior to folding lead sleeve.

J. Gutters / Downspouts:
1. Install gutters as detailed.
2. Install downspouts plumb and level, attached to columns or wall with straps located at top and bottom of downspout and maximum ten (10) feet on center.
3. Install splash pad or block under discharge port of downspouts (if non exist). Install splash pan over a protection (walkway) pad for downspouts located at roof level.

3.4 CLEANING AND PROTECTION

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean of stains.

B. Remove scraps and debris and leave work area clean.

C. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. Paint areas where finish is damaged on pre-finished metal by painting with a compatible paint in color to match undamaged finish.

D. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

E. Paint metal flashings that have been soiled with bitumen with aluminized paint.

F. Clean other work damaged or soiled by Work of this Section.

G. Protect finished work from damage.

END OF SECTION

SECTION 07 65 00

FLEXIBLE FLASHING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide flexible flashing where shown on drawings or required.

1.2 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions.

B. Certification: Manufacturer's affidavit that materials used in Project contain no asbestos.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Manufacturers listed whose product meets or exceeds the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

2.2 MATERIALS

A. Flashing:
   1. Copper Laminated Flashing:
      a. Flashing: A full sheet of copper weighing five (5) ounces per square foot coated or bonded on both sides with one (1) of the following:
         1) Modified asphalt compound coated.
         2) Asphalt saturated, waterproof glass fiber laminated fabric.
      b. Approved Manufacturers:
         1) Advanced Building Products, Inc.
         2) Hohmann & Barnard, Inc.
         3) Sandell Manufacturing Company, Inc.
         4) York Manufacturing, Inc.
      c. Mastic: manufacturer recommended asphalt troweled mastic for sealing copper laminated flashings
   2. Asphalt-free Copper Fabric Flashing (Contractor's Option – in lieu of item above):
      a. Glass fabric scrim bonded to a full sheet of copper for general thru-wall flashing as an alternative to asphalt coated copper specified above and where sealant compatibility is required. Provide manufacturers approved seam tape.

b. Approved Product/Manufacturer: Multi-flash 500 as manufactured by York Manufacturing, Inc,; or Copper-Tuff as manufactured by Hohmann & Barnard, Inc. (No substitutions)

3. Membrane Flashing:
   a. Self-Adhered Flexible Flashing: 40-mil, rubberized asphalt adhesive reinforced flashing with a high density cross laminated polyethylene film. Provide compatible substrate primer as instructed by manufacturer.
   b. Approved Products/Manufacturers:
      1) "TW-Thru Wall Flashing" manufactured by Tamko Waterproofing.
      2) "Perm-A-Barrier" manufactured by W. R. Grace & Co.
      3) "Blueskin TWF" manufactured by Henry Company
      4) "Bitu-Rap" manufactured by Nervastral, Inc.
      5) "Air-Shield" manufactured by W.R. Meadows, Inc.
      6) "AquaFlash 500" manufactured by Fiberweb.
4. Substrate Primer: as instructed by membrane manufacturer
5. Termination Bar: 1/8 inch thick by 1 inch minimum wide stainless steel, w/ pre-punched holes, and self-tapping screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Flashing:
1. Follow manufacturer's instructions for mechanically fastened installation with a termination bar.
2. Application Guidelines - Install flashing at the following locations:
   a. Membrane Flashing: material transitions inside exterior cavity walls, roof edge/exterior wall transitions, masonry joints (control/expansion) inside exterior cavity walls, exterior door and window frame perimeters, roof deck/exterior wall transitions, exterior wall penetrations (i.e. pipe, conduit, ducts, etc.). Provide membrane at all joints, holes, gaps, or openings to ensure a continuously sealed building envelope. Utilize primer on substrates as instructed by manufacturer.
   b. Copper Flashing: At all horizontal wall flashing, including (but not limited to) exterior wall sill/weep conditions, exterior door and window head/weep conditions, masonry wall cap flashing and masonry wall base flashing.
3. Apply substrate primer as instructed by membrane manufacturer to suit condition.
4. Provide drip edge flashing at weep conditions with membrane flashing. Cut membrane flush with outside edge of brick over top of drip edge flashing to alleviate exposure to UV degradation and deterioration of asphalt membrane.
5. On Horizontal Surfaces: The flashing shall be laid in a slurry of fresh mortar and topped with a fresh full bed of mortar. The flashing shall be cut flush with the exterior face of the wall after being left exposed for inspection purposes only. Flashing shall be carried through the wall, turned up where possible to facilitate drainage through the weepholes, then carried upward across the cavity a minimum of six (6) inches. Flashing will then be secured in back wall with termination bar.
6. On Vertical Surfaces: Surfaces receiving the flashing shall be sufficiently spotted with asphalt mastic to hold in place until masonry is set. Secure in back wall with termination bar.
7. Foundation Sill Dampproofing: The flashing for foundation sills shall be laid in a slurry of fresh mortar and topped with a fresh full bed of mortar. The flashing shall be cut flush with the exterior face of the wall after being left exposed for

inspection purposes only. Flashing shall be sloped across the cavity and turned up the wall a minimum of ten (10) inches and secured to back wall with termination bar. Where sill and column meet, flashing shall be brought up a minimum of ten (10) inches up the column.

8. Thru-Wall Flashing: Shall be cut flush with the exterior face of the wall after being left exposed for inspection purposes only. Carry flashing through the wall, turned up where possible to facilitate drainage through the weepholes, then carried upward across the cavity a minimum of six (6) inches, unless noted otherwise, and secure in back wall with termination bar.
9. Cavity Wall: Flashing shall be laid in a slurry of fresh mortar and topped with a fresh full bed of mortar. Flashing shall be cut flush with the exterior face of the wall after being left exposed for inspection purposes only. Flashing shall be carried through the wall and upward across the cavity a minimum of six (6) inches, unless noted otherwise, and secured in the back wall with termination bar. Vertical membrane joints shall be secured with termination bar as instructed by membrane manufacturer.
10. Heads and Sills: Flashing for heads and sills shall be cut flush with the exterior face of the wall after being left exposed for inspection purposes only. Flashing shall be carried through the wall and upward across the cavity a minimum of six (6) inches, unless noted otherwise. Head flashing shall be carried six (6) inches beyond both end of the steel lintel. Both head and sill flashing shall be turned up at the sides to form a pan. All corners shall be folded, NOT CUT. Install weepholes.
11. Spandrels: Spandrel flashing shall start from the outside toe of the shelf angle, go up the face of the beam and then through the wall, turned up on the inside not less than two (2) inches. Install weepholes.
12. Parapet or Coping: Flashing for parapets or coping sills shall be laid in a slurry of fresh mortar and topped with a fresh full bed of mortar. Flashing shall be cut flush with the exterior face of the wall after being left exposed for inspection purposes only. Weepholes shall be installed immediately on top of the flashing.
13. Lengths: Install flashings without longitudinal joints within walls, if possible. If required materials are not available in a single width, join by lapping material minimum two (2) inches and seal joint throughout its length with adhesive.
14. End Joints: Avoid end joints in flashing. When end joints are necessary, lap flashing minimum six (6) inches and seal joint continuously with adhesive.
15. Penetrations: Where anchors, pipes, and inserts penetrate flashing, make opening in flashing snug and seal with adhesive.
16. Reglet Termination: Insert wedge into place and seal carefully with adhesive
17. Termination Bar: Install flashing with termination bars in accordance with manufacturer's instructions. Provide 3 coursing at all termination bars, typical.
18. Top Coat: After flashing material is in place (except in masonry joints where bond and mortar is required) trowel full 1/8 inch protective coating or mastic on all flashing faces.

B. Bed Joints: Coordinate work with Division 4, Masonry. Install thru-wall flashings between two (2) thin layers of masonry mortar without increasing thickness of mortar joint. Keep outer edge of flashing material back 3/4 inch from face of masonry.

3.2 APPLICATION

A. Protect membrane from overexposure to direct sunlight.

B. Follow manufacturer’s recommendations for installation.

C. Adjacent Work: Protect work by masking, covering, or other precautionary methods. Remove protection when no longer necessary.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 INSTALLATION RESPONSIBILITY

A. In addition to the items normally a part of this Section, coordinate the installation of roof accessory curbs and pipe flashings and equipment supports that may be specified elsewhere.

B. Coordinate the Work specified herein with the following Work:
1. Roofing
2. Roofing sheet metal
3. Mechanical equipment
4. Plumbing

1.2 REFERENCES

A. Federal Specifications (FS)
1. TT-S-00227E

B. National Roofing Contractors Association (NRCA)

C. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
1. Architectural Sheet Metal Manual

1.3 SUBMITTALS

A. Product Data: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.

B. Shop Drawings: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

1.4 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

1.5 WARRANTY

A. Warranty the Work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to, the following:
1. Noticeable deterioration of finish
2. Leakage of water into the building or within the construction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Specifications are based on products of named manufacturers. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

2.2 PREFABRICATED ROOF CURBS

A. Frames:
1. Material: ASTM A 653 G90 hot-dipped galvanized steel.
   a. Minimum 18 gauge, and as engineered by manufacturer.
   b. Minimum 18 gauge for curbs supporting HVAC units
   c. Minimum 20 gauge for expansion joint curbs.
2. Corners: Mitered and welded (welds are micro sealed and prime painted after fabrication). Bolted connections not accepted.
3. Base Plates: Integral to frame and welded.
4. Internally reinforced with galvanized 1 inch by 1 inch by 12 gauge angles for curbs exceeding 3 foot length. Reinforce internal bulkhead at equipment curbs to support lateral loads.
5. Wood Nailers: Factory installed, pressure treated. Size and width as suitable for support of items installed on curbs.

B. Insulation: Factory installed 1-1/2 inch thick three-pound density fiberglass insulation.

C. Curb Height: Minimum 8 inch above finished roof.

D. Construct curbs to match roof slope with plumb and level top surface for mounting mechanical equipment.

E. Gasketing: 1/4 inch thick, one (1) inch wide at roof top units.

F. Counterflashing: 18 gauge galvanized steel.

G. Counterflashing Cap: Stainless steel.

H. Cants:
1. Non-canted curb style installs either under or on top of metal decks with insulation.
2. Cants shall be provided under Section 07 52 19 - Roofing

I. All insulated roof curbs shall be structural and shall include calculations signed and sealed by a registered Structural Engineer. Refer to installation drawings for any additional structural requirements. If curbs do not span a minimum of two bar joists, only two angles will be required. Coordination mechanical equipment weight loading on the roof with Structural Engineer.

J. Approved Manufacturers:
1. Custom Curb, Inc.
2. Roof Products, Inc.

2.3 PIPE SUPPORTS

A. Gas Pipe Supports:
   1. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (10 inches x 16 inches x 3 inches; 6 lbs. each); Model Type PP-10 with strut & hanger for lines 2-1/2 inches and smaller, Model Type PS-1-2 with hanger for lines 3 inches and larger.
   2. As manufactured by Portable Pipe Hanger, Inc.; Miro Industries Inc.; MAPA Products; or Architect approved equal.

B. Electrical Conduit / Condensate Lines:
   1. Provide strut type support with recycled plastics and carbon black for UV protection bases (10 inches x 16 inches x 3 inches; 6 lbs. each), install with hold clips ordered as an accessory; Model Type PP-10 with strut.
   2. As manufactured by Portable Pipe Hanger, Inc.; Miro Industries Inc.; MAPA Products; or Architect approved equal.

C. Chill Water Lines:
   1. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (size as required); Model Type PS-1-2 and Model Type PSE-2-2 as required.
   2. As manufactured by Portable Pipe Hanger, Inc.; Miro Industries Inc.; MAPA Products; or Architect approved equal.

D. Installation:
   1. Locate as indicated by Drawing at no greater than 8 feet-0 inches o.c.
   2. Provide protective traffic pads below each support, tacked in place with approved mastic or adhesive.
   3. Install hold down clips if indicated on the drawings or required.

2.4 ROOF TO ROOF EXPANSION JOINT

A. Stainless Steel expansion joint covers on new wood curbs, as detailed on drawings and outlined the NRCA and SMACNA manual.

2.5 DOWNSPOUT WALL NOZZLE

A. Downspout Wall Nozzle at Concealed Roof Drain Leader / Discharge: Josam 25010 Series cast bronze Downspout Nozzle with loose flange and inlet threaded connection or Architect approved equal. Diameter appropriate to downspout size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof accessories in accordance with manufacturer's printed instructions and approved shop drawings. Installation of Portable Pipe Hangers shall not exceed six (6) feet on center.

B. Coordinate with roofing operation for watertight integrity.

C. Finished installation shall be water and air tight. Install sealant conforming to FS TT-S-00227E, Type II, Class A.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING AND FIRE SAFING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Non-combustible firestopping and fire safing materials, and accessories as shown on drawings, or if not shown, as required, including, but not limited to the following:
   1. Intumescent Caulks, Elastomerics, Sealants, Compounds, Putties, Joint Sprays, Wrap Strips, and Coatings
   2. Silicone Sealants
   3. Mortar Materials (Cementitious)
   4. Firestopping Foam Materials
   5. Fire Block Materials
   6. Pillow Materials
   7. Mat Materials
   8. Cast-in-place Devices, Collars, and other materials, including fire/smoke stop systems, which meet the specified requirements.

B. General description of the work in this section:
   1. Only tested firestop systems shall be used in specific locations as follows:
      a. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
      b. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
      c. Openings and penetrations in fire-rated partitions or walls containing fire doors.
      d. Openings around structural members which penetrate floors or walls.

1.2 RELATED WORK

A. Section 03 30 00 - Cast-In-Place Concrete

B. Section 04 20 00 - Masonry

C. Section 07 21 00 - Building Insulation

D. Section 07 81 00 - Sprayed Fireproofing

E. Section 07 92 00 - Building Sealants

F. Section 09 24 00 - Lath and Plaster

G. Section 09 21 16 - Gypsum Wallboard Systems: Wallboard used for fire rated construction.

H. Division 23 - Mechanical: Requirements for penetrations through fire rated construction.

I. Division 26 - Electrical: Requirements for penetrations through fire rated construction.

1.3 REFERENCES

A. ASTM International (ASTM)
1. C665, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
2. E84, standard Test Method for Surface Burning Characteristics of Building Materials
3. E119, Standard Test Methods for Fire Tests of Building Construction and Materials
4. E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops
5. E2174, Standard Practice for On-Site Inspection of Installed Fire stops

B. National Fire Protection Association (NFPA)
1. 70, National Electric Code
2. 101, Life Safety Code

C. Underwriters Laboratories (UL)
1. 263, Fire Tests of Building Construction and Materials
2. 1479, Fire Test of Through-Penetration Firestops
3. 2079, Tests for Fire Resistance of Building Joint Systems
4. UL Fire Resistance Directory:
    a. Firestop Devices (XHJI)
    b. Fire Resistance Ratings (BXRH)
    c. Through-Penetration Firestop Systems (XHEZ)
    d. Fill, Voids, or Cavity Material (XHHW)
    e. Forming Materials (XHKU)
    f. Joint Systems (XHBN)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

1.4 PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

A. Firestopping Materials:
1. Shall be rated as non-combustible when tested in accordance with ASTM E119 to achieve fire rating noted on the drawings and provide a fire rating equal to that of construction being penetrated. If no such fire rating is noted on the drawings, the fire rating shall be required by the authorities having jurisdiction.
2. If such materials are used in a through-penetration seal condition, they shall be approved for such use, with all required devices and accessories forming an assembly or included in the test, when tested in accordance with ASTM E814 or UL 1479.
3. Tests shall be performed by an approved testing agency to indicate compliance with specified requirements and the resulting approval number shall be the latest or current test approved by authorities having jurisdiction. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

B. Fire safing Materials:
   1. Shall be tested and rated non-combustible to achieve fire rating noted on the drawings, or if not noted, as required by authorities having jurisdiction.
   2. If such materials are used in an assembly, they shall be approved for such use, with all required devices and accessories forming an assembly or included in the test.
   3. Tests shall be performed by an approved testing agency to indicate compliance with specified requirements and the resulting approval number shall be the latest or current test approved by authorities having jurisdiction.
   4. Proposed fire safing materials and methods shall conform to applicable governing codes having local jurisdiction.

C. Definitions: As they appear in this Section:
   1. Combustible: Penetrations composed of any material which will burn or melt in a fire, including, but not limited to the following:
      a. Nonmetallic pipes made of glass or plastic.
      b. Metallic pipes made of lead or aluminum.
      c. Electrical, data, communication, security, and telephone cables.
   2. Non-combustible: Penetrations composed of any material which will not burn or melt in a fire, including, but not limited to the following:
      a. Metallic pipes made of steel, iron or copper.
   3. Approved Testing Agencies: UL or other testing agency licensed and equipped to conduct the required fire tests and approved by authorities having jurisdiction.
   4. Authorities Having Jurisdiction: Shall be the person or entity responsible for applicable governing code enforcement.

D. Manufacturer Qualifications: Those listed in Paragraph 2.1, A, or company specializing in manufacturing the products specified in this Section with minimum of five (5) years experience. Refer Division 1 for substitutions.

E. Installer Qualifications: Company specializing in performing the Work of this Section with minimum three (3) years experience installing tested and classified firestop and fire safing systems or manufacturer certification and approval.

F. Standards: All firestop and fire safing systems shall have a flame (F) rating and temperature (T) rating conforming to applicable building codes and in accordance with Drawings and Specifications.

G. Single Source Responsibility: Obtain firestopping and fire safing materials from a single manufacturer for each different product required.

H. No firestopping or fire safing materials shall be concealed or covered until they have been observed and approved for use by the Architect and/or authorities having jurisdiction.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. As scope and performance documents, the Drawings and Specifications do not necessarily indicate or describe all the Work required for the performance and completion of the Work. Contracts will be let on the basis of such documents with the understanding that the Contractor shall furnish and install the items required for proper completion of the Work without adjustment to price or schedule. Work shall be of sound, quality construction and the Contractor shall be solely responsible for the inclusions of adequate labor and materials to cover the proper and timely furnishing and installation of the firestopping and fire safing indicated, described, or implied.

B. As a performance specification, the criteria for the solution of the firestopping and fire safing indicated on the Drawings or specified herein are for the sole purpose of defining the design intent and performance requirements. The details shown, if any, are intended to emphasize the acceptable performance requirements for this Project. To avoid any misunderstanding or lack of interpretation, the Contractor is hereby advised that the responsibility for all firestopping and fire safing are totally his and that designs and resolutions proposed by the Contractor through his submittals and related documentation shall be demonstrated throughout the Work and warranty period specified herein.

C. Design proposal submissions which follow exactly the details indicated on the Drawings, will not relieve the Contractor of his responsibility for the design, furnishing, installation, or performance of the Work of this Section.

D. In the event of a controversy over any requirements of this Section, the decision of the Architect will take precedence.

1.6 SUBMITTALS

A. Product Data:
1. Manufacturer's technical data on product characteristics, performance, and limitation criteria for each material including UL firestop systems to be used.
2. Manufacturer's installation instructions.
3. Manufacturer's Material Data Sheets (MSDS)

B. Shop Drawings: Manufacturer's shop drawings or detail sheets indicating each condition that requires a penetration or joint seal. Details must be in accordance with the proposed approved system. Include materials to be used, anchorage, methods of installation and relationship to all adjacent construction.

C. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

D. Certifications:
1. Manufacturer's certification of compliance indicating approval of authorities having jurisdiction for combustibility and use of materials, and that their installation conforms to shown or required fire rating.
2. Manufacturers affidavit that materials used in Project contain no asbestos.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.8 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installer Training: A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

1.9 REGULATORY REQUIREMENTS

A. Conform fire resistance ratings and surface burning characteristics of authorities having jurisdiction.

B. Provide certificate of compliance from manufacturer indicating approval of authorities having jurisdiction for combustibility and use of materials, and that their installation conforms to shown or required fire rating.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not use materials that contain flammable solvents.

B. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

C. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

D. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

E. Provide ventilation in areas to receive solvent cured materials.

1.11 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination

1.12 SEQUENCING

A. Sequence Work to permit firestopping and fire safing materials to be installed after adjacent and surrounding work is complete.

1.13 WARRANTY

A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.

B. Defects shall include, but not be limited to:

1. Use of incorrect material within the installation
2. No mineral wool insulation within a system that requires it.
3. Use of mineral wool insulation when ceramic fiber insulation is required.
4. Incorrect amount of material is installed within system.
5. No use of an accessory seal within a system that requires one.
6. Use of an incorrect system with a firestop or fire safing installation
7. Failure to meet specified performance or quality assurance requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/PRODUCTS

A. Subject to compliance with through penetration firestop systems listed in Volume II of the UL Fire Resistance Directory (XHEZ), manufacturers specified are approved for use in the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 01.
   1. Hilti, Inc.
   2. Nelson Firestop Products
   3. Specified Technologies, Inc.
   4. Tremco Inc.
   5. 3M Fire Protection Products

B. To maintain clarity of products, specifications are based on specified products manufactured by Hilti, Inc.; Tulsa, OK. Listed manufacturers providing equivalent products are acceptable for use on this project.

C. It is recognized that the manufacturers listed may not produce all of the specified types of products, therefore, products from several manufacturers may be used throughout the project as long as consistent use of each individual product is maintained throughout the project, they meet the requirements specified herein for the intended use, and are approved for that use by authorities having jurisdiction. Products which are combined to form a UL listed assembly must be provided as tested and approved as shown in the Fire Resistance Directory.

2.2 MATERIALS AND COMPONENTS

A. General:
   1. Any of the following materials, either by itself or in combination with other materials may be used on the Project provided they:
      a. Satisfy the firestopping and fire safing requirements for use in the required application on the Project.
      b. Meet the performance and quality assurance requirements specified herein.
      c. Are approved for use in that application by the authorities having jurisdiction.
   2. Materials shall comply with ASTM E814 (UL 1479) or ASTM E119 (UL 263), and shall be manufactured of non-toxic, non-hazardous, asbestos free materials. Product shall bear proper independent test laboratory label/logo and shall conform to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

B. Primers: Conform to firestop manufacturer's recommendations for primers required for

various substrates and conditions.

C. Back-Up (Damming) Materials: Conform to firestop manufacturer's recommendations for back-up (damming) materials. Material may be removable or permanent as recommended by manufacturer to suit application and as required by UL testing or other testing agency approved by authorities having jurisdiction.

D. Retainers: Steel angles, clips, sheet metal, and impaling fasteners to support damming material and fire safing material and where required by UL testing or other testing agency approved by authorities having jurisdiction.

E. Adhesives and Fasteners: Conform to firestop manufacturer's recommendations for adhesives and fasteners required for various substrates and conditions and to suit intended use. Materials must conform to those required by UL testing or other testing agency approved by authorities having jurisdiction.

F. Firestopping Fill, Void, and Cavity Materials: Shall conform to those required by UL testing or other testing agency approved by authorities having jurisdiction, including, but not be limited to the following. Refer to list of approved manufacturers:
   1. Cast-in place firestop devices for use with combustible and non-combustible pipes (closed and open piping systems) and cable bundles penetrating concrete floors, the following products are acceptable:
      a. "CP 680 Cast-In Place Firestop Device" manufactured by Hilti, Inc
         1) Add Aerator adaptor when used in conjunction with aerator ("sovent") system.
      b. "CP 681 Tub Box Kit" for use with tub installations manufactured by Hilti, Inc
      c. "CP 682 Cast-In Place Firestop Device" for use with noncombustible penetrants manufactured by Hilti, Inc
   2. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
      a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
      b. "CP 604 Self-leveling Firestop Sealant" manufactured by Hilti, Inc.
      c. "CP 620 Fire Foam" manufactured by Hilti, Inc.
      d. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
      e. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
   3. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
      a. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
      b. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
      c. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
   4. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
      a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc
   5. Foams, Intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
      a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc
      b. "CP 620 Fire Foam" manufactured by Hilti, Inc
      c. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc
      d. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc
   6. Non curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

a. "CP 618 Firestop Putty Stick" manufactured by Hilti, Inc
b. "CP 658T Firestop Plug" manufactured by Hilti, Inc

7. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
   a. "CP 617 Firestop Putty Pad" manufactured by Hilti, Inc.
8. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
   a. "CP 643N Firestop Collar" manufactured by Hilti, Inc
   b. "CP 644 Firestop Collar" manufactured by Hilti, Inc
   c. "CP 645/648 Wrap Strips" manufactured by Hilti, Inc.
9. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   a. "CP 637 Firestop Mortar" manufactured by Hilti, Inc
   b. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc
   c. "CP 620 Fire Foam" manufactured by Hilti, Inc
   d. "CP 675T Firestop Board" manufactured by Hilti, Inc
10. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
    a. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc
    b. "CP 675T Firestop Board" manufactured by Hilti, Inc.
11. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
    a. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc
    b. "CP 658T Firestop Plug" manufactured by Hilti, Inc

G. Fire Related Construction Joints and Other Gaps:
   1. "CP 601S" Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
   2. "CP 606" Flexible Firestop Sealant" manufactured by Hilti, Inc.
   3. "CP 672" Firestop Joint Speed Spray" manufactured by Hilti, Inc.

H. Fire Safing Materials: Comply with ASTM C665, Type I, high-melt mineral-fiber insulation with minimum nominal density of 4.0 lbs. per cubic foot and having a maximum flame spread rating of 15 and smoke developed rating of 0. Size shall be 4 inches thick by 24 inches wide by 48 inches long, unless noted otherwise. Products containing asbestos strictly prohibited.
   1. "Thermafiber Safing Insulation" manufactured by Thermafiber, Inc.
   2. "Fibrex Safing Insulation" manufactured by Fibrex Insulations, Inc.
   3. "Delta Safing Board" manufactured by Rock Wool Manufacturing Company.

I. Jacketing (For use with fire protection board): 0.016 inch aluminum or 0.010 inch stainless steel roll jacketing as shown, or if not shown, as required where high traffic requires high durability and good appearance, and as directed by Architect.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine joints and openings indicated or required to receive firestop and fire safing materials, for compliance with requirements for proper configuration, installation tolerances and other conditions affecting firestop and fire safing performance.

B. Do not proceed with installation until unsatisfactory conditions are corrected.

C. Beginning installation shall indicate acceptance of existing conditions. Work found to be defective or deficient due to uncorrected existing conditions prior to installation should be repaired or replaced at no additional expense to Owner.

3.2 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Verify penetrations are properly sized and in suitable condition for application of materials.
   2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
   3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
   4. Install back-up (damming) materials to arrest liquid material leakage.
   5. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

3.3 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trades to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.4 INSTALLATION

A. General:
   1. Install firestop and fire safing materials in accordance with manufacturer's recommendations to provide F and T ratings as required by authorities having jurisdiction.
   2. Install firestop materials in accordance with UL Fire Resistance Directory.
   3. Install firestop and fire safing materials with sufficient pressure to properly fill and seal openings, then tool or trowel exposed surfaces.

B. Firestopping Materials:
   1. Install primer and firestopping material in sufficient thickness, with required accessories to achieve rating, to uniform density and texture, in accordance with manufacturer's instructions and authorities having jurisdiction.
   2. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
   3. Consult with mechanical engineer, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
   4. Remove dam material after firestopping material has cured or allow dam material to remain if required to maintain fire rating integrity or required by authorities having jurisdiction.
   5. Do not conceal or enclose any firestopping materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.

C. Fire Safing Materials:
   1. Install fire safing in sufficient thickness, with retainer materials where shown or required to achieve fire rating in accordance with manufacturer's instructions and authorities having jurisdiction.
   2. Do not conceal or enclose any fire safing materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.

D. Fire Protection Board Materials:
   1. Install fire protection board in proper type, size, and density, with adhesives, fasteners, and jacketing materials where shown or required to achieve fire rating in accordance with manufacturer's instructions and authorities having jurisdiction.
   2. Do not conceal or enclose any fire protection board materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.

3.5 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.6 CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops”.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exterior sealants and sealants for moving joints, except for joints in those systems listed under Related Work.

B. Interior sealants and caulking.

1.2 RELATED WORK

A. Section 04 20 00 - Unit Masonry: masonry control and expansion joints

B. Division 7 - Roofing Sections: Sealants used in conjunction with roofing.

C. Section 07 84 00 - Firestopping: firestopping penetrations

D. Section 07 62 00 - Sheet Metal Flashing, Gutters, Downspouts and Trim: Sealants used in conjunction with sheet metal items.

E. Section 08 80 00 - Glazing Systems: glazing sealants

F. Section 09 21 16 - Gypsum Board assemblies: acoustical sealants

G. Division 23 - Mechanical Sections

H. Section 32 13 13 - Concrete Paving: site concrete paving expansion joint sealant

1.3 REFERENCES

A. ASTM International (ASTM)
   1. C717, Standard Terminology of Building seals and Sealants
   2. C793, Standard Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants
   3. C794, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
   4. C834, Standard Specification for Latex Sealants
   5. C920, Standard Specification for Elastomeric Joint Sealants
   6. C1193, Standard Guide for Use of Joint Sealants

B. Sealant, Waterproofing and Restoration Institute (SWRI)
   1. The Processional’s Guide

1.4 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions

B. Sample: On site sample for Architect's approval of colors.

C. Certification: Manufacturer’s affidavit that materials used in Project contain no asbestos.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: experienced in building sealant installation whose work has resulted in sealant installations with a record of successful performance.

B. Source Limitations: unless specifically indicated, obtain each type of building sealant through one source from a single manufacturer.

C. Pre-construction Field Adhesive Testing: Prior to installation of building sealants, field test their adhesion to joint substrates in accordance with manufacturer’s instructions. Perform test in locations indicated by Architect. Perform test for each type of building sealant and each substrate as required by Architect. If required by Architect, arrange for tests to be performed with sealant manufacturer’s representative present. Follow-up review by Architect and manufacturer may be required to observe sealant performance over time and may result in re-application of sealant or replacement.

D. Cleaning: Facade sealants that have collected dirt at the time of Substantial Completion shall be cleaned over the entire facade prior to acceptance by the Owner. 11 months after final completion of the building, if the sealant joints show dirt, they shall again be cleaned over the entire façade.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of sealants when joint substrates are wet or when ambient temperature conditions are above limits permitted by sealant manufacturers or are below 40 degree F.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of sealants until contaminates which may interfere with adhesion are removed from substrates.

1.7 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

B. In addition, refer to information above concerning Field Adhesive Testing.

1.8 WARRANTY

A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to:
1. Leaking
2. Cracking, splitting or releasing from substrate
3. Deterioration or color change

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Specifications are based on the products or materials of the named manufacturer, otherwise selection may be made from any manufacturer listed below whose products meet or exceed the specifications. Other manufacturers must have a minimum of five (5) years experience manufacturing the products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

1. Typical Sealants:
   a. Bostik
   b. Pecora, Inc.
   c. Sonneborn
   d. Sika
   e. Tremco Incorporated
2. Silicone Sealants at Appliances:
   a. Pecora, Inc.
   b. General Electric Co.
   c. Dow Corning

2.2 MATERIALS

A. Caulking for Exposed Non-Working Interior Locations:
1. Type: Acrylic Latex, conforming to ASTM C834; single component, paintable.
2. Applications: Use for interior wall and ceiling joints, joints between door and window frames and wall surfaces, and other interior non-traffic-bearing joints for which no other type of sealant is indicated.

B. Sealant for Working Joints and Exposed Vertical Exterior Locations:
1. Type: Polyurethane, conforming to ASTM C920, Type M, Grade NS, Class 25; multi-component, non-sagging.
2. Applications: Use for:
   a. Control, expansion, and soft joint masonry. Refer to drawings and Section 04200, Unit Masonry for specific locations. Provide full sealant joints at building expansion joints.
   b. Joints between concrete and other materials.
   c. Joints between metal frames and other materials.
   d. Other exterior non-traffic-bearing joints for which no other type of sealant is indicated.

C. Sealant for Exposed Exterior Traffic-bearing Locations:
1. As specified in section 32 13 13, Concrete Paving

D. Acoustical Sealant:
1. As specified in section 09 21 16, Gypsum Board Assemblies

E. Rubber Sealant:
1. Type: Butyl sealant, conforming to ASTM C920, Type NT, Grade NS, Class 12-1/2; single component, solvent release, non-skinning, non-sagging.
2. Movement Capability: Plus and minus 12-1/2 percent
3. Service Temperature range: -13 to 180 degree F

F. Sealant at Sanitary Locations:
1. Type: Single component, silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 25, mildew resistant, non-yellowing.

2. Application: Use for joints between plumbing fixtures and floor and wall surfaces, and joints between kitchen and bathroom counter tops and wall surfaces, unless indicated otherwise. Use at all Kitchen appliances.
3. See Section 09 30 13, Ceramic Tile for sealant at tile surfaces.
4. Approved Product/Manufacturer: Sanitary SCS1700 Sealant manufactured by General Electric Company, Pecora Corp., Dow Corning, or Architect approved equal.

G. Primers, Cleaners, Top Coats: Use only materials listed as suitable in resistance to staining, compatibility and durability before proceeding.

H. Expanded Polyethylene Joint Filler: Provide flexible, compressible, closed-cell, polyethylene of not less than 10 psi compression deflection (25 percent); except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants, surface water absorption of not more than 0.1 pounds per square foot, as manufactured by Sonneborn, or pre-approved equal.

I. Sealant Backer Rod: Provide compressible rod stack of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, non-absorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type, which will not be deteriorated by sealant application temperature as indicated.

J. Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

PART 3 - EXECUTION

3.1 APPLICATION

A. Temperatures: Do not install sealants when air temperature is under 40 degrees F. Sealants may be warmed to ease installation when recommended by the manufacturer.

B. Tooling: Tool exposed joints to a slightly concave surface using slicking materials recommended by the manufacturer. The tooling procedure shall press sealant against the sides of the groove. No materials shall be left "feathered" out or smeared on the abutting materials. If necessary, protect adjacent surfaces with tape. Completed joints shall have a uniform professional appearance. Use an anti-tack compound on sealant that does not set up fast enough to avoid dust collection.

C. Sealant Back-Up: Provide back-up filler where groove depth is too great to fill with sealant. Review joint design with Architect.

D. Compressive Filler: Seal vertical expansion joints with fillers. Provide compressible filler twice the width of the joint and with a depth of 1-1/2 times the compressed width. Lap ends 2 inch minimum.

E. Seal ends together in such a manner to allow natural drainage. Install filler by compressing material and sliding into joint. Align filler on one face of the joint before it expands to the full joint width.

END OF SECTION

Section 08 11 00 – Hollow Metal Doors and Frames

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work under this section comprises of furnishing hollow metal doors and frames, including transom frames, sidelight and window frames with provision for glazed, paneled or louvered openings, fire labeled and non-labeled, as scheduled.
   1. Flush Steel Doors.
   2. Temperature Rise Doors.
   3. Full Glass Entrance Doors.
   4. Steel frames.
   5. Hollow Metal Framing Systems.

1.2 RELATED SECTIONS

A. Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section. The latest published edition of each reference applies.
   1. Section 06 10 00 – Rough Carpentry
   2. Section 08 14 00 – Wood Doors.
   3. Section 08 71 00 – Door Hardware.
   4. Section 08 80 00 – Glazing.
   5. Section 09 90 00 – Painting and Coating.
   6. Section 28 10 00 – Access Control.

1.3 REFERENCES

A. The intent of this document is that all hollow metal ant its application will comply or exceed the standards identified below. The latest published edition of each reference applies.
   1. ANSI/NFPA 80 - Standard for Fire Doors and Windows.
   2. ANSI/DHI A 115.IG - Installation Guide for Doors and Hardware.
   3. ANSI/BHMA A 156 - Specifications for Hardware Preparations in Standard Steel Doors and Frames.
   4. ANSI/BHMA A156.7 - Hinge Template Dimensions.
   5. ANSI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish for Steel
   6. ANSI A 250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
   7. ANSI/SDI A250.6-2003 Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
   8. ANSI/SDI A 250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
   9. ANSI A 250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   10. ANSI A 250.11 - Recommended Erection Instructions for Steel Frames.
   11. ANSI/UL 10C - Standard for Safety for Positive Pressure Fire Tests of Door Assemblies.
   12. ASTM - American Society for Testing and Materials
   13. ASTM A568-2011 Standard Specification for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
   14. ASTM A591 Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight
   15. ASTM A653-2011 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process
   16. ASTM E 152 - Standard Methods of Fire Tests of Door Assemblies.
   17. NAAMM/HMMA – Hollow Metal Manufacturers Association.
   18. SDI - Steel Door Institute
   19. SDI-105 – Recommended Erection Instructions for Steel Frames.

20. SDI-107 – Hardware on Steel Doors (reinforcement application).
21. SDI-111 - Recommended Standard Details for Steel Doors & Frames.
22. SDI-118 – Basic Fire Door Requirements.
23. NFPA-101 – Life Safety Code.
24. NFPA 105 – Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives.
25. NFPA 252 - Standard Method of Fire Tests of Door Assemblies.
26. ANSI-A117.1 – Accessible and Usable Building and Facilities.
27. Federal Emergency Management Agency (FEMA) 361 Guidelines, ICC500-2014
28. UL - Building Materials Directory; Underwriters Laboratories Inc.
29. WH - Certification Listings; Warnock Hersey International Inc.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's standard details and catalog data indicating compliance with referenced standards, and manufacturer's installation instructions.

C. Certificates:
1. Manufacturer's certification that products comply with referenced standards.
2. All Hollow Metal must be provided by an SDI Certified Manufacturer.

D. Shop Drawings: Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Shop drawings should include the following information Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, to ensure doors and frames are properly prepared and coordinated to receive hardware.
1. Elevations of each door type.
2. Details for door core
3. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
4. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
5. Mounting locations for hardware
6. Thickness of reinforcement/preparations for hardware
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

E. LEED Submittals: Provide documentation of how the requirements of Credit 4.1 and 4.2 will be met:
1. Program Based on the U.S. Green Building Council LEED Reference Guide for Green Building Design and Construction Publication for the design, construction and major renovations of commercial and institutional buildings including core and shell and K-12 school projects.
2. Credits MR 4.1 and MR 4.2: Use materials with recycled content such that the sum of the post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 20% total based on cost of the total values of the material in the project.
3. Credits:
   a. MR 4.1: 1 point -recycled content is at least 10% of the total value of the materials in the entire project.
   b. MR 4.2: 1 additional point added to the MR 4.1 point – recycle content is at least 10% (MR 4.1 percentage plus an additional amount to equal a minimum of 20%) of the total value of the materials in the entire project.

F. Samples: 18 by 24 inches (457 by 610 mm) cut away sample door with provisions for lockset, hinge and corner section of frame.

1.5 QUALITY ASSURANCE

A. All substitution requests must be submitted within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his consultant

B. Select a qualified hollow metal distributor, who is a direct account of the manufacturer of the products furnished. In addition, that distributor must have in their regular employment an Architectural Hardware Consultant (AHC), Certified Door Consultant (CDC), Architectural Openings Consultant (AOC), or an Door & Hardware Specification Consultant (DHSC) or equivalent door and hardware industry experience who will be available to consult with the Architect and Contractor regarding any matters affecting the door and frame opening.

C. Manufacturer Qualifications: Certified Member of the Steel Door Institute.

D. Installer: Minimum five years documented experience installing products specified this Section.

E. Fire Rated Doors and Frames: Underwriters' Laboratories, Warnock Hersey, and Factory Mutual labeled fire doors and frames:
1. Label fire doors and frames in accordance with Underwriters Laboratories standard UL10C Positive Pressure Fire Tests of Door Assemblies.
2. Construct and install doors and frames to comply with current issue of NFPA 80.
3. Manufacture Underwriters' Laboratories labeled doors and frames under the UL Follow Up Service (FUS) and in strict compliance to UL procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
4. Manufacture Intertek Testing Services / Warnock Hersey labeled doors and frames under the ITS/WH factory inspection program and in strict compliance to ITS/WH procedures, and provide the degree of fire protection capability indicated by the opening class.
5. Manufacture FM labeled doors and frames under the FM factory inspection program and in strict compliance to FM procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
6. Affix a physical label or approved marking to each fire door or fire door frame, at an authorized facility as evidence of compliance with procedures of the labeling agency.
7. Conform to applicable codes for fire ratings. It is the intent of this specification that hardware and its application comply or exceed the standards for labeled openings. In case of conflict between types required for fire protection, furnish type required by NFPA and UL.
8. Fire door assemblies in exit enclosures and exit passageways; maximum transmitted temperature end point rating of not more than 250 degrees F (121 degrees C) above ambient at the end of 30 minutes of the standard fire test exposure.
9. For openings required to be fire rated exceeding limitations of labeled assemblies, submit manufacturer’s certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction. If applicable, obtain a written approval from the authority having jurisdiction to use these products on this project.
10. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with hardware and other door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle, store and protect products in accordance with the manufacturers printed instructions and ANSI/SDI A250.8, A250.10, and NAAMM/HMMA 840.

B. Store doors vertically in a dry area, under a proper vented cover. Protect doors from adverse weather elements.

C. Store frames in an upright position with heads uppermost under cover. Place on 4 inch (102 mm) high wood sills to prevent rust and damage. Store assembled frames five units maximum in a stack with 2-inch (51 mm) space between frames to promote air circulation.

D. Do not use non-vented plastic or canvas shelters to prevent rust or damage.

E. Should wrappers become wet, remove immediately.

F. The supplier shall deliver all materials to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Supplier shall coordinate delivery times and schedules with the contractor.

G. Deliver doors cardboard wrapped or crated to provide protection during transit and job site storage. Provide additional protection to prevent damage to any factory-finished doors. Mark all doors and frames with opening numbers as shown on the contract documents and shop drawings.

H. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the architect. Otherwise, remove and replace damaged goods as directed.

1.7 COORDINATION

A. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.

B. Coordinate Work with frame opening construction, door and hardware installation.

C. Sequence installation to accommodate required door hardware.

D. Verify field dimensions for factory assembled frames prior to fabrication.

1.8 WARRANTY

A. All doors and frames shall be warranted in writing by the manufacturer against defects in materials and workmanship for a period of one (1) year commencing on the date of manufacture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: MESKER a Dormakaba Brand, Toll Free Tel: 844-463-7537.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

C. Provide all steel doors and frames from a single SDI certified manufacturer.

2.2 DOORS

A. General: Construct exterior/interior doors to the following designs and gages:

1. Exterior Doors: Zinc-Iron Alloy-Coated galvanealed steel, ASTM A 653, A40 minimum:
   a. Thickness:
      1) 16 gauge
   b. Close tops of exterior swing-out doors to eliminate moisture penetration. Galvanealed steel top caps are permitted.
2. Interior Doors: Cold-rolled steel, ASTM A 1008/A 1008M:
   a. Thickness:
      1) 18 gauge
3. Interior Doors: Zinc-Iron Alloy-Coated galvanealed steel, ASTM A 653, A40 minimum:
   a. Thickness:
      1) 18 gauge
4. Prime Finish Doors: Clean, phosphatize and factory prime painted doors indicated on Door Schedule as HM.
5. Glass moldings and stops:
   a. Fabricate from 20 gage minimum steel:
   b. Install trim into the door as a four-sided welded assembly with mitered, reinforced and welded

corners.
c. Trim: identical on both sides of the door.
d. Labeled and non-labeled doors: use the same trim.
e. Channeling requirements:
1) Cutouts larger than 36” in height require 18 gage perimeter channelings in the cutout of the door prior to installation of the lite kit our louver.

6. Hardware Reinforcements:
a. Hinge reinforcements for full mortise hinges: minimum 7 gage.
b. Lock renforcements : minimum 16 gage.
c. Closer reinforcements: minimum 14 gage steel.
d. Projection welded hinge and lock reinforcements to the edge of the door.
e. Provided adequate reinforcements for other hardware as required.

B. Full Flush Doors:

1. Acceptable Product: Mesker N Series.
a. Performance:
1) Physical performance: 1 million cycles per ANSI A250.4.
2) Thermal performance (gasketed).
a) Polystyrene core.
2. Door Thickness: 1-3/4 inches.
3. Door faces reinforced and sound deadened as follows:

a. Polystyrene Core: Full 1-3/4 inches thick rigid polystyrene, adhered to inside of door faces and polystyrene core with waterproof adhesive for bond strength and rust prevention.

4. Vertical edge seams: Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges. Finish edges as follows:

a. Filled Vertical Edges (S): Continuous vertical mechanical interlocking joints with tack welds every 8 inches. Putty or filler applied to the edge seam and ground smooth.

5. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm). Square edges on hinge and/or lock stiles are acceptable.
6. Reinforce top and bottom of doors with galvanealed 16 gauge minimum, welded to both panels.
7. Fire Rating: Supply door units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

2.3 DOOR FRAMES

A. General: Construct exterior/interior metal door frames to the following designs and gages;

1. Exterior Frames: Zinc-Iron Alloy-Coated galvanealed steel, ASTM A 653, A40 minimum:
a. Thickness:
1) 14 gauge.
2. Interior Frames in Masonry: Zinc-Iron Alloy-Coated galvanealed steel, ASTM A 653, A40 minimum:
a. Thickness:
1) 16 gauge.
3. Interior Frames in stud wall construction: cold rolled steel, ASTM A 1008/A 1008M.
a. Thickness:
1) 16 gauge.
4. Electrical Requirements: Coordinate all electrical requirements for doors and frames. Make provisions for installation of electrical items so that wiring can be readily removed and replaced.
a. Provide cutouts and reinforcements required for metal door frame to accept electric components.
b. Frame with Electrical Hinges: Junction box welded over center hinge reinforcing. Top or bottom

hinge locations are not permitted.
c. Provide cutouts and reinforcements required to accept security system components.
d. Coordinate with Section 08710 for electrified hardware items.

B. Flush Steel Frames:

1. Acceptable Product: Mesker F-Series.
   a. Performance:
      1) Physical performance: 1 million cycles per ANSI A250.4
2. Construction: Factory-welded three-sided frames.
   a. Face welded: Weld miter joints between head and jamb faces completely along their length either internally or externally. The remaining elements of the frame profile (soffit, stop and rabbets) are not welded. Grind and finish face joints smooth.
3. Profile:
   a. Face:
      1) 2 Inches face dimension and types and throat dimensions indicated on the Door Schedule.
   b. Stops:
      1) Standard 5/8-inch-high stops
4. Provide following reinforcement and accessories:
   a. Preparation for 4-1/2 inches high, standard weight, or heavy weight, full mortise hinges; with plaster guard. Minimum 7-gauge steel.
   b. Hinge Preparation for 5-inch-high, universal standard weight, or heavy weight, full mortise hinges; with plaster guard. Minimum 7-gauge steel.
   c. Preparation for continuous hinge reinforcement. Minimum 14-gauge steel.
   d. Strike preparation (single doors) for 4-7/8-inch universal strike; with plaster guard. Minimum 16-gauge steel.
   e. Closer preparation minimum 14-gauge steel.

   Silencers. Prepare frames to receive inserted type door silencers, 3 per strike jamb on single doors. Stick-on silencers are permitted on paired openings.
5. Fire Rating: Supply frame units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.
6. Finish: Factory prime finish in accordance with ANSI A 250.10.

2.4 HOLLOW METAL FRAMING SYSTEMS

A. Hollow Metal Framing Systems:

1. Acceptable Product: Mesker S-Series, M-Series.
2. Components: Construct architectural stick frame assemblies of standard frame components, fabricated as specified.

   a. Interior Frames in stud wall construction: 16 gauge cold rolled steel, ASTM A 1008/A 1008M steel.
   b. Exterior Frame Material: Galvanealed steel, ASTM A 653, Class A40 minimum, 14 gage cold rolled frames.
   c. Include galvanealed components and internal reinforcements with galvanealed frames.

3. Frame component requirements:

   a. Prepare required sticks at door openings and frame assemblies for hardware as specified in Section 08710.
   b. Fabricate frame assemblies from three basic components:
      1) Open Sections (perimeter members) identical in configuration to standard frames.
      2) Closed sections (intermediate members) with identical jamb depth, face dimensions, and stops as open sections.

3) Sill sections: To be flush with both faces of adjacent vertical members. Cut individual components to length and notched to assure square joints and corners.

c. Externally welded face joints at meeting mullions or between mullions and other frame members on the face surfaces only. Grind and finish face joints smooth.

d. Fabricate frame assemblies for shipment to the jobsite completely welded.
   1) Field joints permissible only when the size of the total assembly exceeds shipping limitations.
   2) Fabricate oversized frames in sections designated for splicing in the field.

e. Pierced and dimpled glazing beads for use with manufacturers' standard fasteners.

f. Provide necessary anchors for jambs, heads, and sills of assemblies.

g. Verify field dimensions as required. Do not begin fabrication until these dimensions have been verified, and approved.

4. Accessories:

   a. Glazing Bead: Formed steel sheet; screw-attached.

5. Fire Rating: Provide factory assembled welded units bearing Labels for fire ratings indicated on the Drawings.

6. Finish: Factory prime finish in accordance with ANSI A 250.10.

2.5 ACCESSORIES

A. Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.

B. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings.

C. Plaster Guards: Same material as door frame, minimum 24 gage (0.5 mm) minimum; provide for all strike boxes. Plaster guards not mandatory on interior after set frames.

D. Silencers: Resilient rubber, Inserted type, three per strike jamb for single openings. Stick-on silencers shall not be permitted.

E. Glazing: Specified in Section 08 80 00.

2.6 FABRICATION

A. Steel Frames:

1. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
   a. Clearances shall comply with the requirements of NFPA 80 Chapter 5.
2. Factory-welded frames: Head and jamb intersecting corners mitered at 45 degrees, with back welded joints ground smooth.
   a. Continuous face weld the joint between the head and jamb faces along their length either internally or externally. Grind, prime paint, and finish smooth face joints with no visible face seams.
   b. Externally weld, grind, prime paint, and finish smooth face joints at meeting mullions or between mullions and other frame members per a current copy of ANSI/SDI A250.8.
3. Provide temporary steel spreaders (welded to the jambs at each rabbet of door openings) on welded frames during shipment. Remove temporary steel spreaders prior to installation of the frame.

B. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

C. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

D. Unless otherwise indicated, provide exposed fasteners with countersunk flat or oval heads for exposed screws and bolts.

E. Prepare doors and frames to receive mortised and concealed hardware per final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI-107 and ANSI-A115 Series specifications for door and frame preparation for hardware.

F. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site. Provide internal reinforcements for all doors to receive door closers and exit devices where scheduled.

G. Locate hardware as indicated on Shop Drawings or, if not indicated, per the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

H. Exposed door and frame surfaces to be cleaned and treated then coated with rust inhibitive primer. Water-based primer and color paint finishes to be free of Hazardous Air Pollutants (HAPS) and Volatile Organic Compounds (VOVS). Paint to comply with ANSI A250.3 and A250.10.

2.7 FINISHES

A. Chemical Treatment: Treat steel surfaces to promote paint adhesion.

B. Factory Prime Finish: Meet requirements of ANSI A 250.10.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are acceptable before beginning installation of frames.

B. Do not begin installation until conditions have been properly prepared.

C. Correct unacceptable conditions before proceeding with installation.

3.2 INSTALLATION

A. Install doors and frames in accordance with manufacturer's printed installation instructions and with Steel Door Institute's recommended erection instructions for steel frames ANSI A250.11 and NAAMM/HMMA 840.

B. Fire Doors and Frames: Install in accordance with ANSI/NFPA 80.
   1. To ensure compliance with Positive Pressure criteria as required by UBC7-2, UL10C, NFPA5000 and all applicable Local, State and National Code Jurisdictions, all Doors and Frames should be checked for accurate installation per Manufacturers installation instructions to provide proper fire and Smoke Gasketing as tested and listed.
   2. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100. Install fire rated doors with clearances specified in NFPA 80.

C. Comply with provisions of SDI-105, “Recommended Erection Instructions for Steel Door Frames,” unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
   1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
   2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors. Use additional anchors as required for height per manufacturers’

installation instructions.

3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices. Use additional anchors as required for height per manufacturers' installation instructions.
4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws. Secure Sill Anchors to floor. Use additional anchors as required for height per manufacturers' installation instructions.

D. Remove temporary steel spreaders prior to installation of frames.

E. Set frames accurately in position; plumb, align and brace until permanent anchors are set. After wall construction is complete, remove temporary wood spreaders.
1. Field splice only at approved locations indicated on the shop drawings.
2. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.

F. Provide full height 3/8 inch (9.5 mm) to 1-1/2 inch (38 mm) thick strip of polystyrene foam blocking at frames requiring grouting. Apply the strip to the back of the frame to facilitate field drilling or tapping.

G. Grouting Hollow Metal Frames:
1. Provide and install temporary bottom and intermediate wood spreaders to maintain proper width and avoid bowing or deforming of frame members. Refer to ANSI A250.11-2001 and NAAMM/HMMA 840.
2. Comply with ANSI/SDI Standard A250.8, paragraph 4.2.2, and HMMA 820 TN01 Grouting Hollow Metal Frames, whereby grout will be mixed to provide a 4 inch (102 mm) maximum slump consistency and hand toweled into place. Do not use grout mixed to a thinner consistency.
3. Provide a vertical wood brace during grouting of frame at openings over 4 foot (1219 mm) wide, to prevent sagging of frame header.

H. Glaze and seal exterior transom, sidelight and window frames in accordance with HMMA-820 TN03.

I. Apply hardware in accordance with hardware manufacturers' instructions and Section 08 71 00 of these Specifications. Install hardware with only factory-provided fasteners. Install silencers. Adjust door installation to provide 1/8" at head and 1/8" at strike and hinge jamb with door undercut to meet fire ratings and floor conditions to achieve maximum operational effectiveness and appearance.

3.3 FIELD QUALITY CONTROL

A. Fire-Rated Door Assembly Testing:
1. Upon completion of the installation, test each fire door assembly to confirm proper operation of its closing device and verify that it meets all criteria of a fire door assembly per NFPA 80.
2. Perform inspections by individuals with documented knowledge and understanding of the operation components of the type of door being tested.
3. Provide a written record to the Owner with copies available to the Authorities Having Jurisdiction (AHJ).
4. Record shall list the fire door assembly and include the door number with an itemized list of hardware set components for each door opening and location in the facility.

3.4 ADJUST AND CLEAN

A. Adjust doors for proper operation, free from binding or other defects.

B. Clean and restore soiled surfaces. Remove scraps and debris and leave site in a clean condition.

C. Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

D. Properly clean and apply paint to doors and frames in accordance with HMMA-840 TN01 and ANSI A250.8

appendix B along with Manufactures recommended surface preparation for painting.

3.5 PROTECTION

A. Protect installed products and finished surfaces from damage during construction.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide items shown on the drawings and specified, including, but not limited to the following:
   1. Standard and fire rated steel doors
   2. Steel frames for doors, sidelites, transoms, and windows.
   3. Louvers and vision lites in steel doors, if shown or required.

1.2 RELATED WORK

A. Section 04 20 00 - Unit Masonry

B. Section 05 40 00 – Cold Formed Metal Framing

C. Section 05 50 00 – Metal Fabrications

D. Section 08 14 23.16 - Plastic Laminate Faced Wood Doors

E. Section 08 71 00 - Finish Hardware (Allowance)

F. Section 08 80 00 - Glazed Systems: Glazing in doors, sidelites, transoms, and windows.

G. Section 09 91 00 - Painting and Staining

1.3 REFERENCES

A. American National Standards Institute (ANSI)
   1. A115.IG, Installation Guide for Doors and Hardware
   2. A224.1, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors & Frames.
   3. A250.8, Recommended Specifications for Standard Steel Doors and Frames. (Formerly SDI-100)
   4. A250.11, Recommended Erection Instructions for Steel Frames (Formerly SDI-105).

B. ASTM International (ASTM)
   1. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   2. A924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
   3. A1008, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
   4. A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

5. C1363 - Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus
6. E283 – Standard Test Method for Determining the rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
7. E413 - Standard Classification for Rating Sound Insulation
8. E2074, Standard Test Method for Fire Tests of Door Assemblies (Formerly A152)

C. Federal Specification (Fed Spec)
1 Fed Spec C578 Bead Fusion Test

D. Hollow Metal Manufacturers Association (HMMA)
1. HMMA 802 - Manufacturing of Hollow Metal Doors and Frames.
2. HMMA 810 - Hollow Metal Doors.
3. HMMA 830 - Hardware Preparation and Locations for Hollow Metal Doors and Frames.
4. HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames.
5. HMMA 850 - Fire Rated Hollow Metal Doors & Frames.
6. HMMA 890 - Technical Summary of Hollow Metal by HMMA

E. National Fire Protection Association (NFPA)
1. 80, Fire Doors and Fire Windows
2. 252, Fire Tests of Door Assemblies

F. Steel Door Institute – Current Standards
1. Technical Data Series

G. Underwriters Laboratories Inc. (UL)
1. Building Materials Directory
2. Listing and Labeling
3. 10B and 10C, Fire Tests of Door Assemblies
4. 1784, Air Leakage Tests of Door Assemblies

H. Intertek Testing, Services (Warnock Hersey, Inc. (WHI))
1. Listing and Labeling

1.4 SUBMITTALS

A. Product Data:
1. Manufacturer's standard details and catalog data demonstrating compliance with specifications and referenced standards.
2. Manufacturer's installation instructions.

B. Shop Drawings:
1. Indicate complete schedule in detail for each steel door and frame using the same reference number for details and openings as those on the Contract Drawings. If any door is not by the steel door manufacturer only the door opening number should be shown along with the type of door (wood, plastic laminate faced, etc.).
2. Show details of construction, installation, connections, anchors, hardware reinforcement, hardware preparation, louvers, and floor and threshold clearances.

C. Samples are required from non-Steel Door Institute members:
   1. 12 inch x 12 inch sample of a fire-rated and non-rated door, cut from corner of door, showing door construction.
   2. 12 inch x 12 inch sample of each type of door louver specified or required, showing louver construction.
   3. 6 inch long sample of a fire-rated, non-rated frame, and each type of glass stop specified or required, showing corner and construction.

D. Certificates:
   1. Manufacturer's certification that oversized openings are in compliance with specifications.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: If other than a manufacturer listed under Paragraph 2.1 is proposed for use on the Project, it shall be a company specializing in the manufacturer of steel doors and frames of the type specified for this Project with a minimum of five (5) years experience.

B. All steel doors and frames shall be by a single manufacturer, shop drawings to be submitted with manufacturer's insignia which is being supplied.

C. Furnish steel doors and frames to meet current ANSI/Steel Door Standards.

D. ANSI/SDI-A250.13 (2003) Testing and Rating of Sever Windstorm Resistant Components for Swing Door Assemblies.

E. ASTM E 330-97, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

F. Comply with ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.6 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies:
   1. Fire-Rated Door, Panel, Frame, and Fire Window Construction: Shall conform to ASTM E2074, NFPA 252, or UL 10B, as applicable, and acceptable to the code authorities having jurisdiction.
   2. Fire-Rated Door Construction:
      a. Not withstanding any other requirements of this Specification, provide gauge of metal, method of construction, hardware preparation, reinforcement, and placement, glass opening size, and other specifics required to obtain the specified or required label. The label shall contain the fire resistance rating (20 minute, 45 minute, 1 hour, 1-1/2 hour, 3 hour, etc.) and the designation (A, B, C, D, or E). Doors with "B" Label shall be 1-1/2 hour.
      b. Fire-rated doors used in a stairway enclosure, shall be so constructed so that the maximum transmitted temperature shall not exceed 450 degrees F above ambient temperature at the end of 30 minutes of the Standard Fire Exposure Test and shall be so noted on the label.

3. Fire-Rated Openings: Conform to NFPA 80 for fire-rated class shown or required by code authorities having jurisdiction.
   a. Units shall be identical to assemblies whose fire resistance characteristics have been determined in accordance with requirements specified under Paragraph C, 01, above, and shall be labeled and listed by UL, WHI, or other inspection and testing agency acceptable to the code authorities having jurisdiction.
   b. Fire-rated steel doors, panels, frames, and fire windows shall bear permanent labels attesting to fire resistance. At stairway enclosures, provide units listed for 450 degree F maximum temperature rise rating for 30 minutes of exposure.
   c. Oversized openings shall be constructed in accordance with all applicable requirements for labeled door construction.
   d. Fire rated door assemblies with gaps in excess of 1/8 inch between door and frame will not comply with NFPA 80.
   e. Locate label on hinge side of doors and frames so that when door is closed, label is not visible.
   f. Caution shall be taken to ensure that labels are not removed, damaged or painted over.
   g. Glass panes shall not exceed sizes allowed whether indicated or not on the drawings.

B. Wind Loads: Provide hollow metal and door hardware assemblies approved by the Texas Department of Insurance, including anchorage, capable of withstanding windload design pressures which are calculated for this project by a registered Architect or Engineer and is part of the construction documents per the Texas Department of Insurance, authorities having jurisdiction and the International Building Code Design Loads per section 1609.

C. Hurricane-Resistance Test Performance: Provide hollow metal and door hardware approved assemblies that pass large missile-impact tests, as required by Texas Department of Insurance systems location above grade, and cyclic-pressure tests according to testing requirements of authorities having jurisdiction.
   1. Impact Resistance: Hollow metal with approved door hardware assemblies must satisfy the Texas Department of Insurance's criteria for protection from windborne debris in both the Inland 1 zone and the Seaward zone. The assemblies must have passed the large missile impact test (which equates to Missile Level D specified in ASTM E 1996-02). The assemblies may be installed at any height on the structure as long as the design pressure rating for the assemblies is not exceeded. These assemblies will and do not need to be protected with an impact protective system when installed in areas where windborne debris protection is required.

1.7 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

1.8 COORDINATION

A. Coordinate the Work of this Section with work in which hollow metal work is installed.

B. Coordinate hardware installation with opening construction. Finish hardware is specified in Section 08 71 00.

C. Coordinate doors, frames, and windows with glazing specified in Section 08 80 00.

D. Coordinate doors and frames with painting specified in Section 09 91 00.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver and store products in accordance with manufacturer's instructions, and as follows:
   1. In manufacturer's original, clearly labeled, undamaged containers or wrappers.
   2. Containers or wrappers shall list the name of the manufacturer and product.

B. Deliver materials to allow for minimum storage time at the project site. Coordinate delivery with the scheduled time of installation.

C. Protect products from moisture, construction traffic, and damage.
   1. Store under cover in a clean, dry place, protected from weather and abuse.
   2. Store in a manner that will prevent rust or damage.
   3. Store doors in a vertical position, spaced with blocking to permit air circulation.
   4. Do not use non-vented plastic or canvas shelters.
   5. Should containers or wrappers become wet, remove immediately.

1.10 WARRANTY

A. Warrant the work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.

B. Defects shall include, but not be limited to:
   1. Use of incorrect materials in opening
   2. Incorrect labeled components installed within opening.
   3. Noisy, rough or difficult operation
   4. Failure to meet specified quality assurance requirements.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must comply with Paragraph 1.5, A, Manufacturer Qualifications, must manufacture equivalent products to those specified and comply with requirements of Division 1 regarding substitutions to be considered.
   1. Amweld Building Products, Inc., Garrettsville, OH; (330) 527-5122
   2. CECO Door Products, Brentwood, TN; (615) 661-5030
   3. Curries Company, Mason City, IA; (515) 423-1334
   4. Deansteel Mfg. Co., San Antonio, TX; (210) 226-8271
   5. Door Pro Systems, Inc., Houston, TX; (713) 462-0860
   6. Mesker Door Inc., Huntsville, AL; (256) 851-6670
   7. Pioneer Industries, Inc., Kewanee, IL; (309) 856-6000
   8. Republic Builders Products Company, McKenzie, TN; (800) 733-3667
   9. Steelcraft Mfg. Co., Cincinnati, OH; (513) 745-6400

2.2 MATERIALS, GENERAL

A. Steel requirements, all frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A1008 general requirements. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A1011.

B. Exterior frames and interior frames where shown on drawings or required in damp, moist, humid, and wet areas, i.e., toilets, locker rooms, showers, etc., to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel and galvannealed to 'A-60' minimum coating weight standard per ASTM-A653 and A924, with coating weight of not less than 0.60 ounce per square foot (0.30 ounce per square foot per side).

2.3 FRAME FABRICATION

A. Minimum Gauges:
   1. Interior Openings:
      a. Less than 4 feet-0 inches in Width: 16 gauge
      b. 4 feet-0 inches in Width and greater: 14 gauge
   2. Exterior Openings: 14 gauge

B. Design and Construction:
   1. Frames shall be custom made, welded units with integral trim of sizes and shapes shown on approved shop drawings. Hinge jambs that butt adjacent 90 degree walls shall have at least four (4) inch wide frame face to assure the door trim will not strike the wall prior to the door opening at least 90 degrees. Frame profile shall match wall thickness where practical, i.e., 4-3/4 inch at 4 inch CMU, 6-3/4 inch at 6 inch CMU, and 8-3/4 inch at 8 inch CMU. At masonry wall openings, fabricate frames to suite masonry opening with 2 inch head member.
   2. Frames shall be strong and rigid, neat in appearance, square, true and free of defects, warp and buckle. Molded members shall be clean cut, straight and of uniform profile throughout their length.
   3. Jamb depths, trim, profile and backbends shall be as shown on approved shop drawings.
   4. Corner joints, including face and inside corners, shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops butted. The use of gussets shall not be permitted. Face of frame shall be ground smooth. Knockdown (KD) frames are not permitted.
   5. Minimum depth of stops shall be 5/8 inch, except at fire windows where minimum depth of stops shall be 3/4 inch.
   6. Frames for multiple openings shall have mullion and rail members which are closed tubular shapes having no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth. Mullions shall be key locked removable type. Keys shall be master keyed to Owner's Best system.
   7. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
   8. Continuous Hinge Reinforcement: Provide welded continuous 12 gage strap for continuous hinges specified in hardware sets in Division 8 Finish Hardware.
   9. Provide countersunk flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
   10. Provide A60 Galvannealed coating at frames in restrooms and locker rooms with showers/Jacuzzi, clean areas such as kitchen rooms.
   11. Electrical Knock Out Boxes: Factory weld 18 gage electrical knock out boxes to frame for electrical hardware preps; included but not limited to electric thru wire

hinges, electrical raceways, door position switches, electric strikes, jamb mount card readers, and magnetic licks as noted in door hardware sets in Division 8 Finish Hardware.

a. Electrical knock out boxes are required at door position switches, electric strikes, card readers, and middle hinge locations for all exterior locations regardless of electrical hardware specified in Division 8 Finish Hardware.
b. Provide electrical knock out boxes with ¾-inch knockouts.
c. Conduit to be coordinated and installed in field from middle hinge box and strike box to door position box.
d. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 8 Finish Hardware.
e. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
f. Provide field installed conduit per Division 28 section for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 8 Finish Hardware. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

12. Hardware Reinforcements:
    a. Frames shall be mortised, reinforced, drilled and tapped at factory for fully template mortised hardware in accordance with approved hardware schedule and templates provided by Section 08 71 00. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.
    b. Minimum thickness of hardware reinforcing plates shall be as follows:
        1) Hinge and pivot reinforcements (1-1/4 inch x 10 inch minimum size): 7 gauge
        2) Strike reinforcements: 12 gauge
        3) Flush bolt reinforcements: 12 gauge
        4) Closer reinforcements: 12 gauge
        5) Reinforcements for surface-mounted hardware, hold-open arms, surface panic devices: 12 gauge
13. Floor Anchors: Minimum 14 gauge, securely welded inside each jamb, with holes for floor anchorage.
14. Jamb Anchors:
    a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the T-Strap type. Anchors shall be not less than 16 gauge steel. The number of anchors provided at each jamb shall be as follows:
        1) Frames up to 7 feet-6 inch height - Three (3) anchors
        2) Frames 7 feet-6 inch to 8 feet-0 inch height - Four (4) anchors
        3) Frames over 8 feet-0 inch height - One (1) anchor for each 2 feet or fraction thereof in height.
    b. Frames for installation in wood or metal stud partitions shall be provided with steel anchors of suitable approved design, not less than 16 gauge thickness, securely welded inside each jamb as follows:
        1) Frames up to 7 feet-6 inch height - Four (4) anchors
        2) Frames 7 feet-6 inch to 8 feet-0 inch height - Five (5) anchors
        3) Frames over 8 feet-0 inch height - Four (4) anchors plus one (1) additional for each 2 feet or fraction thereof over 8 feet-0 inches.
    c. Frames to be anchored to previously placed concrete, masonry or structural steel shall be provided with anchors of suitable design as shown

on approved shop drawings.

15. Dust Cover Boxes: Shall be of not less than 26 gauge steel and shall be provided at all mortised hardware items. Eight (8) inch CMU walls with face brick shall have dual offset jamb anchors.
16. Steel Spreader: Shall be provided on all frames, temporarily attached to bottoms of both jambs for bracing during shipping and handling.
17. Loose Glazing Stops: Shall be of cold rolled steel, not less than 20 gauge, butted at corner joints and secured to the frame with countersunk cadmium or zinc-plated screws. Loose stops at exterior frames shall be placed on the interior side of the frames.
18. At sound rated door openings and at masonry openings, coat inside of frame profile with corrosion resistant coating to minimum thickness of 1/16 inch.

C. Frame Color: Field painted under Section 09 91 00 to match face of door.

2.4 DOOR FABRICATION

A. Minimum Gauges:
1. Interior Doors: 0.047 inch or 18 gauge (16 gauge for high frequency doors)
2. Exterior Doors: 0.059 inch or 16 gauge (14 gauge for windstorm rated doors)

B. Design and Construction:
1. Types: Doors shall be custom fabricated, of types and sizes shown on approved shop drawings, and shall be seamless face construction with no visible seams or joints on vertical edges with fully welded seams free from blemishes and defects.
2. Thickness: Shall be 1-3/4 inch, unless specifically noted or shown otherwise.
3. Exterior Doors: Provide doors with 22 gage steel z-channels placed at 6 inches apart with foamed in place polyurethane core, with a thermal insulation calculated R factor of 11.01 per ASTM C518 Standards.
4. Fabrication:
   a. Doors shall be strong, rigid and neat in appearance, free from warpage and buckle.
   b. Corner bends shall be true and straight and of minimum radius for gage of metal used.
   c. Provide 22 gauge steel stiffeners spaced maximum six (6) inches on center and extending full height of door.
   d. Fill interior with noncombustible fiberglass insulation. Use mineral board filler as required for labeled doors.
   e. Faces shall be joined at vertical edges of door by a continuous weld extending full height of door. Welds shall be ground, filled and dressed smooth to provide a smooth flush surface.
   f. Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending full width of door and spot weld to both faces. Exterior doors shall have an additional flush closing channel at top and bottom edges. Openings shall be provided in the bottom closure channel at top and bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
   g. Continuous Hinge Reinforcement: Provide welded continuous 12 gage strap for continuous hinges specified in hardware sets in Division 8 Finish Hardware.
   h. Electrical Raceways: Provide raceways for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door

hardware specified in hardware sets in Division 8 Finish Hardware. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

i. Doors within in wet or humid areas shall have a top cap and solid foam interior core to prevent internal moisture accumulation and galvannealed.

j. Edge profile shall be provided on both vertical edges of door as follows:
   1) Single-Acting Swing Doors: Beveled 1/8 inch in 2 inches.

k. Hardware Reinforcements:
   1) Doors shall be mortised, reinforced, drilled and tapped at factory for fully template hardware, in accordance with the approved hardware schedule and templates provided by Section 08 71 00. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
   2) Minimum gauges for hardware reinforcing plates shall be as follows:
      a) Hinge & pivot reinforcements: 7 gauge
      b) Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge

5. Glass Moldings and Stops: Loose stops shall be not less than 20 gauge steel, with butt corner joints, secured to frame opening by countersunk screws. Snap-on attachments will not be acceptable.
6. Louvers: Shall be inverted "V" blade, sightproof type, unless noted otherwise.
7. Edge Clearances:
   a. Between Door and Frame at Head and Jambs: 1/8 inch
   b. At DoorSills with No Threshold: 5/8 inch to 3/4 inch above finished floor
   c. At DoorSills with Threshold: As required to suit threshold
   d. Between Meeting Edges of Double Doors: 1/8 inch

C. Finish:
1. Shop paint steel (whether galvanized or ungalvanized) stops and accessories as follows:
   a. Clean surfaces free of mill scale, rust, oil, grease, dirt and other foreign matter.
   b. Chemically treat surfaces and apply one (1) coat of an approved baked-on rust-inhibitive primer paint to provide a minimum 0.5 mil dry film thickness.
2. Field painted under Section 09 91 00.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for openings requiring fire protection ratings as scheduled and to comply with NFPA 80. Such doors and frames shall be constructed as tested and approved by UL, WHI, or other nationally recognized testing agency having a factory inspection service and approved by code authorities having jurisdiction and shall bear the appropriate permanent label.

B. If any door or frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its size, design, hardware or other reason; the Architect shall be so advised before fabrication work on that item is started.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Separate dissimilar metals. Protect against galvanic action.

B. Frames:
1. Anchorage and Connections: Secure to adjacent construction. Where practical, interior door frames shall be flush with the pull side wall to minimize or eliminate the reveal and allow full 180 degree door swing.
2. Install frames in accordance with manufacturer's instructions and install labeled frames in accordance with NFPA 80.
3. Frame Spreader Bars: Leave intact until frames are set perfectly square and plumb and anchors are securely attached.
4. Remove hardware, with the exception of prime-coated items, tag box, and reinstall after finish paint work is completed. Do not remove or paint over labels on labeled frames.

C. Doors:
1. Install hardware in accordance with hardware manufacturer's templates and instructions.
2. Install doors in accordance with manufacturer's instructions and install labeled doors in accordance with NFPA 80.
3. Adjust operable parts for correct function.
4. Remove hardware, with the exception of prime-coated items, tag, box, and reinstall after finish paint work is completed. Do not remove or paint over labels on labeled doors.

3.2 ADJUST AND CLEAN

A. Adjust doors for proper operation, free from binding or other defects.

B. Clean and restore soiled surfaces.

C. Remove scraps and debris, and leave site in clean condition.

END OF SECTION

SECTION 08 21 10

FLUSH WOOD DOORS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 06 20 00 - Finish Carpentry and Millwork: Installation of doors and finish hardware.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Door frames.

C. Section 08 71 00 - Finish Hardware

D. Section 08 80 00 - Glazed Systems: Vision glass types for factory glazing

1.2 REFERENCES

A. ASTM International (ASTM)
   1. E2074, Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies

B. Architectural Woodwork Institute (AWI)
   1. Quality Standards

C. Commercial Standard (CS)
   1. 236

D. National Fire Protection Association (NFPA)
   1. 80, Fire Doors and Windows
   2. 252, Standard Method of Fire Tests for Door Assemblies

E. Underwriters Laboratories (UL)
   1. 10 (c), Fire Tests of Door Assemblies - Positive Pressure
   2. Listings for Fire Doors

F. Intertek Testing, Services (Warnock Hersey, Inc. (WHI)
   1. Certification Listings for Fire Doors

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions.

B. Shop Drawings:
   1. Show or schedule location, size, thickness, elevation, details of construction, location and extent of hardware blocking, fire rating, finish requirements and other pertinent data for each door required.
   2. Include schedule of hardware preparation required for each door.
   3. Indicate requirements for veneer matching.

C. Samples:
1. Factory finishes applied to actual door face material, approximately 8 inch by 10 inches, for each material and finish for Architect's selection and approval. For each wood species and transparent finish, provide set of three (3) samples showing typical color range of color and grain to be expected in the finished work. Approved sample will be basis for which all finish work is judged.
2. Corner sections of doors, manufacturer's standard size with door face and edgings representing typical construction. Finish sample with specified veneer demonstrating the range of color and grain for species of veneer and solid lumber required.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AWI Quality Standards, Custom Grade A.

B. Fire Rated Door Construction:
1. Conform to ASTM E2074, NFPA 252, or UL 10 (c) as applicable and as required by code authorities having jurisdiction.
2. Fire doors shall bear labels, permanently attached to the hinge stile or to top rail that:
a. Allows label to be visible when door is open.
b. Are approved by and shows testing laboratory approval for classification specified, scheduled or required. The testing laboratory shall be UL or WHI.

C. Fire Rated Door Installation:
1. Conform to NFPA 80 and as required by code authorities having jurisdiction.

1.5 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01110 - Notification of Architect Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver to site, store, protect, and handle doors in accordance with AWI Quality Standards and manufacturer's instructions. Accept doors on site in manufacturer's standard packaging. HVAC systems shall be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25 percent or greater than 55 percent.

B. Storage:
1. Store doors in a clean and dry location protected from weather and abuse.
2. Stabilize moisture content prior to installation.

C. Wear clean white cotton gloves when handling factory finished doors.

D. Mark each door on the top or in the top hinge with opening numbers corresponding to approved shop drawings.

1.7 WARRANTY

A. Provide for lifetime replacing, including cost of rehanging and refinishing, at no cost to Owner, wood doors exhibiting defects in materials or workmanship including, but not limited to the following:
1. Warp in excess of 1/4 inch as defined by AWI.
2. Warp or twist to a degree that door will not operate properly.
3. Delamination of face veneers.
4. Telegraphing or show through of stiles, rails, or core greater than 0.01 inch in any 3 inch area.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers listed or named in the specifications that produce equivalent products to those specified are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent products to those specified and comply with requirements of Division 1 regarding substitutions to be considered.
1. Algoma Hardwoods, Inc.
2. Eggers Industries
3. Graham Manufacturing Corp.
4. Ideal Architectural Door & Plywood
5. Marshfield Door Systems, Inc., formerly Weyerhaeuer Door Division
6. Oshkosh Architectural Door Company
7. VT Industries, Inc.

2.2 MATERIALS

A. Flush Interior Non-Rated Wood Doors:
1. General: 5-ply, hot-pressed, AWI PC-5 Veneer, Bonded Particle Core, stile and rails abrasively planed as an assembly prior to veneering, factory machine and fit.
2. Thickness: 1-3/4 inch.
3. Core: 32 lbs per cubic foot particleboard, 1LD2 in accordance with ANSI A208.1
4. Stile: LSL, 1-3/8 inch, bonded to core
5. Rail: LSL, bonded to core, 1-1/8 inch minimum, 5 inch head rail for closer reinforcement.
6. Facing: Maple veneer , rotary cut, Custom A grade, book match, center balance
7. Finish: TR-6, clear, UV protected, factory finish as selected by Architect.
8. Pair and Set Match: Provide at doors hung in same opening or separated only by mullions
9. Transom match: continuous match, as occurs
10. Door Edges: All door edges (1-3/4 inch face) shall be wood veneer or stained to match door face as selected by the Architect. Provide factory-applied sealer at top and bottom edge of doors and cut surface of openings.

B. Flush Interior Fire Rated Wood Doors:
1. Meet applicable requirements of Paragraph A above.
2. Doors scheduled to be fire-rated shall receive the appropriate label. Schedule and conform to labeling requirements of code authorities having jurisdiction over this work.
3. Core: 20 minute fire-rated, 1LD2 particleboard, positive pressure Category A. Comply with commercial standard CS 236 and AWI.

C. Mineral Core:
1. Meet applicable requirements of Paragraph A above.
2. Doors scheduled to be fire-rated shall receive the appropriate label. Schedule and conform to labeling requirements of code authorities having jurisdiction over this work
3. Core: asbestos-free, incombustible mineral sections - 45, 60, or 90 minute fire-rated, positive pressure Category A.
4. Stiles and Rails: Manufacturers thickness to achieve rating.
5. Fire rating: as scheduled on drawings.

D. Accessories:
1. Glazing: Factory glaze with glass as indicated. Verify compatibility of glazing system with positive pressure requirements where applicable.
2. Glazing Stops (Where shown): Wood, of same species as door facing. Wood with metal clips for rated doors or rolled steel where required for fire rating prepared for countersink style tamper proof screws. Size for 6 inch by 36 inch vision glass, unless noted otherwise.

3. Adhesive: Type 1
4. Hardware blocking: provide structural composite lumber or solid lumber as required. Coordinate with hardware as scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Doors and hardware installed under Section 06220, Finish Carpentry and Millwork. Follow manufacturer's printed instructions. Coordinate work with door opening construction, and door and frame hardware installation.

B. Clearances:
1. Head and Jambs: 1/8 inch maximum.
2. Sill: 1/2 inch typically, except provide 1/4 inch clearance from top surface of carpeting.

C. Verify that frames comply with indicated requirements for type, size, location and swing characteristics and that the frames are installed plumb, level and parallel. Reject doors with defects that are not repairable.

D. Coordinate hardware installation for proper door operation. Adjust locks and latches to engage snugly without forcing. Align hardware to function without squeaking, binding, or racking. Mortise as required for automatic door bottoms.

E. Protect doors from damage and replace doors that are damaged. Verify that tops and bottoms of doors have been sealed prior to installation, as required for warranty.

F. Interior Fire Rated Wood Doors installed where scheduled.
1. Conform to NFPA 80, UL, and requirements of code authorities having jurisdiction.
2. Do not trim positive pressure rated doors.

3.2 CLEANING AND REPAIRING

A. Clean doors in accordance with manufacturer's instructions.

B. Touch-up damaged finishes to match undamaged finish in accordance with manufacturer's instructions.

C. Repair or replace damaged doors at no expense to Owner.

END OF SECTION

SECTION 08 31 00

ACCESS DOORS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Access doors in gypsum board, masonry partitions, and plaster/stucco soffits, where shown or required.

1.2 SUBMITTALS

A. Product Data:
   1. Manufacturer's literature, including schedules, charts, and illustrations to indicate the performance, fabrication, procedures, product variations, and accessories.
   2. Manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing access doors meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions in order to be considered.
   1. Acudor Products, Inc., Cedar Grove, NJ
   2. Babcock-Davis (Cierra Products), Brooklyn Park, MN
   3. Bar-co, Alfab, Inc., Enterprise, AL
   4. J. L. Industries, Incorporated, Bloomington, MN
   5. Karp Associates, Inc., Maspeth, NY
   6. Larsen's Manufacturing Company, Minneapolis, MN
   7. Milcor LP, Holland, OH
   8. Nystrom Building Products Co. Inc., Minneapolis, MN
   9. The Williams Brothers Corporation of America, Front Royal, VA

B. Specifications are based on products of the Babcock-Davis, Brooklyn Park, MN; (888) 412-3726.

2.2 PRODUCTS

A. General: The following access panel types are for selection as required whether or not indicated on drawings, unless indicated elsewhere in Division 15 or Division 16. The contractor shall evaluate the specific requirements and provide the appropriate system based on the condition, as all types may not be required on the project. The inclusion of any of the listed access panel types does not necessarily imply that the condition exists in the scope of work.

B. Standard type flush steel door for exterior masonry construction:
   1. Size: 2 feet-0 inches x 3 feet-0 inches unless otherwise noted in drawings or specifications.
   2. Hinges: Stainless steel concealed continuous piano type hinges.
   3. Frames: 6063-T5 extruded aluminum frame. Mill finish

4. Doors: 20 gauge galvanized steel. Phosphate dipped and prime coated for field painting per Section 09900.
5. Latch and Lock: Two (2) dual acting handles with exterior lock.
6. Gasketing: Extruded santoprene
7. Insulation: 2 inch thick fiberglass
8. Approved Product: Model "B-XT", or Architect approved equal.

C. Standard type flush steel door for wallboard and masonry construction:
9. Size: 2 feet-0 inches x 3 feet-0 inches unless otherwise noted in drawings or specifications.
   a. Provide 12 inch x 12 inch access panels at all motorized overhead coiling doors, grilles, and coiling counter doors that are located within non-removable ceilings for access to motors for repairs and maintenance of electric operators.
10. Hinges: Concealed continuous piano type hinges.
11. Finish: Phosphate dipped and prime coated for field painting per Section 09900.
12. Frames: 16 gauge galvanized steel with 22 gauge galvanized wallboard corner bead
13. Doors: 14 gauge galvanized steel.
14. Lock: Flush screw driver operated cam.
15. Approved Product: Model "B-NW", or Architect approved equal.

D. Standard type flush steel door for plaster/stucco soffit construction:
1. Size: As shown on the drawings.
2. Hinges: Concealed continuous piano type hinges.
3. Finish: Phosphate dipped and prime coated for field painting per Section 09900.
4. Frames: 16 gauge galvanized steel with 22 gauge galvanized plaster casing bead
5. Doors: 14 gauge galvanized steel.
6. Lock: Flush screw driver operated cam.
7. Approved Product: Model "B-NP", or Architect approved equal.

E. Fire rated flush steel door for wallboard construction:
1. Listing: UL listed 'B' label up to 1-1/2 hours in walls and Warnock-Hershey listed up to 3 hours in ceilings.
2. Size: As shown on the drawings.
3. Hinges: Concealed pin hinge
4. Finish: Phosphate dipped and prime coated for field painting per Section 09900.
5. Frames: 16 gauge galvanized steel with 22 gauge galvanized wallboard corner bead
6. Doors: 20 gauge galvanized steel.
7. Lock: Knurled knob/key operated latch bolt.
8. Insulation: 2 inch thick fire rated mineral fiber
9. Approved Product: Model "B-IW", or Architect approved equal.

E. Insulated access panel for valve box in exterior brick wall:
1. Size: 12 inches x 12 inches, or as required for application.
2. Door: 0.060 6063-T5 extruded aluminum.
3. Frame: 0.060 6063-T5 extruded aluminum.
4. Hinge: Stainless steel concealed piano hinge.
5. Latch: Hex head cam latch operable with standard allen wrench.
6. Flange: 0.080 6063-T5 extruded aluminum.
7. Finish: Paint grip.
8. Insulation: Two (2) inch thick fiberglass.
9. Gasket: Extruded Sanoprene.
10. Approved Product: Model "B-XT", or Architect approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and provide panels to the trade that is constructing the material being penetrated.

3.2 LOCATIONS

A. Provide where required by code and where needed to service and maintain equipment.

B. If not shown on the drawings, consult the Architect before locating in finished spaces.

END OF SECTION

SECTION 08 33 30

OVERHEAD ROLLING DOORS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

1.2 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Wind Loading: Design doors to withstand up to 20 psf wind load or as required by building code authorities having jurisdiction.
   2. Cycle Life: Design doors of standard construction for normal use of up to 20 cycles per day.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer’s specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer’s installation instructions.
   3. Manufacturer's operation and maintenance data.

B. Shop Drawings: Indicating opening sizes, details of curtain slat, track and hardware, attachments, related and adjacent work, materials, and finishes. Furnish wiring diagrams and requirements for electric motor operated doors.

C. Samples: 12 inch x 12 inch sample of slats with specified finish.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing overhead rolling doors with minimum five (5) years experience and approved by manufacturer.

B. Contractor shall have the sole responsibility for entire coiling door assemblies and associated work, shown or required for complete system.

C. Exterior coiling insulated service doors shall be designed to withstand at least a 20 pounds per square foot windload. Windlocks shall be installed on every slat for doors over 14 feet-1 inch wide.

D. All coiling insulated and non-insulated service doors shall be designed to a standard maximum of 25 cycles per day and an overall maximum of 50,000 operating cycles for the life of the door.

1.5 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01110 - Notification of Architect requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products indoors and protect from moisture, construction traffic, and damage.

1.7 WARRANTY

A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to:
   1. Corrosion or other deterioration of finish.
   2. Loose or missing parts.
   3. Difficult or noisy operation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products of manufacturers listed which meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
   1. The Cookson Company, Phoenix, AZ
   2. Cornell Iron Works, Inc.. Mountaintop, PA
   3. McKeon Rolling Steel Door Co., Inc., Brooklyn, NY
   4. Overhead Door Corp., Dallas, TX

B. Specifications are based on named products manufactured by Overhead Door Corp., Dallas, Texas.

2.2 MOTOR OPERATED INSULATED COILING SERVICE DOORS

A. Type/Size/Mounting/Location: Insulated Coiling Door in size(s), mounting(s), and location(s) shown on drawings.

B. Materials:
   1. Door Curtain: Shall be constructed of interconnected strip steel slats conforming to ASTM A653. The slats shall be designated by the manufacturer as No. 45 (measuring three (3) inches high by 7/8 inch deep) consisting of a 22 gauge exterior slat and a 22 gauge interior slat separated by 13/16 inch of rigid insulation. Finish on the door curtain shall be the manufacturer's system consisting of the following:
      a. Hot dipped galvanized G-90 coating consistent with ASTM A653.
      b. Bonderized coating for prime coat adhesion.
      c. Factory applied Thermosetting Powder Coating applied with a minimum thickness of two (2) mils. The color shall be selected by the Architect and shall be chosen from manufacturer's standard color chart.
   2. Bottom Bar: Shall consist of two (2) 1/8 inch angles mechanically joined together with a one (1) inch diameter vinyl covered foam edge astragal continuous along the bottom. The finish on the bottom bar shall be the same finish as indicated for the curtain.
   3. Guides: Shall consist of four (4) steel angles bolted together with 3/8 inch fasteners to form a channel for the curtain to travel. Extruded vinyl snap-on weatherstripping shall be furnished continuously along the exterior leg of each guide. The wall angle portion shall be continuous and fastened to the surrounding structure with either minimum 1/2-inch fasteners or welds, both on 36 inches on center. The finish on the guide angles shall be the same finish as indicated for the curtain.
   4. Brackets: Shall be constructed of steel not less than 1/4-inch-thick and shall be bolted to the wall angle with minimum 1/2-inch fasteners. The finish on the brackets shall be the same finish as indicated for the curtain.

5. Gears: Shall be cast iron with teeth cast from machine cut patterns. The pinion gear shall not be less than a three (3) inch pitch diameter. The gear ratio shall be designed for a maximum effort of not more than 30 pounds.
6. Barrel: Shall be steel tubing of not less than six (6) inches in diameter. Oil tempered torsion springs shall be capable of correctly counter balancing the width of the curtain. The barrel shall be designed to limit the maximum deflection to 0.03 inch per foot of opening width. The springs shall be adjusted by means of an exterior wheel. The finish on the barrel shall be one (1) coat of bronze rust-inhibiting prime paint.
7. Hood: Shall be fabricated from 24-gauge galvanized steel and shall be formed to fit the curvature of the brackets. The hood shall contain a waterproof baffle to control air infiltration. The finish on the hood shall be the same finish as the curtain.

D. Locking Mechanisms: Slide bolts on bottom bar at jambs shall be secured by means of a cylinder lock with interlock switches keyed to the Owner's master keying.

E. Approved Product: Series 610 - Insulated Service Doors, or Architect approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that dimensions are correct and project conditions are suitable for installation.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install insulated coiling doors, with operators and controls, in accordance with manufacturer's instructions. Coordinate installation with electric service.

B. Ensure coiling doors installed adjacent to non-removable ceilings have access doors installed in the non-removable ceilings for repairs and maintenance.

C. Ensure units are installed plumb and true, free of warp or twist, and within tolerances specified by manufacturer for smooth operation.

3.3 DEMONSTRATION

A. Instruct the Owner's personnel in proper operation and maintenance of units.

3.4 ADJUSTING AND CLEANING

A. Fit, align, and adjust door assemblies' level and plumb; provide smooth operation.

B. Clean doors of dirt and grease.

C. Restore slight blemishes in finishes in accordance with manufacturer's instructions to match original finish.

D. Remove labels and visible markings, except those required by authorities having jurisdiction, i.e. U.L. labels.

E. Remove and provide new units where repairs are not acceptable to the Architect at no additional expense to the Owner.

END OF SECTION

SECTION 08 51 13

ALUMINUM WINDOWS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aluminum architectural windows complete with hardware and related components as shown on drawings and specified in this Section.

1.2 RELATED SECTIONS

A. Section 07 92 00 - Building Sealants

B. Section 08 80 00 - Glazed Systems

C. Sections regarding adjacent materials in which windows are installed.

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer's installation instructions.

B. Submit evidence that fabrication of fixed windows has not resulted in any corner or joint failure or glass breakage for a period of not less than ten (10) years.

C. Shop Drawings: Prepared specifically for this project; show dimensions of aluminum windows, elevations, details of all window sections, anchorage and installation details, hardware, and interface with other products.

1.4 QUALITY ASSURANCE

A. Manufacturers proposed for use, which are not named in these specifications, shall have a minimum of five (5) years experience manufacturing products which meet or exceed the specifications.

B. Installer Qualifications: The window manufacturer or their approved representative, using mechanics that have a minimum of three years experience and are skilled in the installation of aluminum windows of the type specified for this project.

1.5 PRE-INSTALLATION CONFERENCE

A. Section 01 31 13 – Project Coordination

1.6 WARRANTY

A. Warrant the work specified herein for ten (10) years from date of Substantial Completion, against becoming unserviceable or causing an objectionable appearance resulting from

either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to:
   1. Corner or joint failure
   2. Abnormal aging or deterioration of finish

PART 2 - MATERIALS

2.1 APPROVED MANUFACTURERS

A. Specifications are based on products of EFCO Corporation, Monett, MO; (800) 221-4169. Manufacturers listed below whose product meets or exceeds the specifications are approved for use on the Project. Other manufacturers must comply with manufacturer's qualifications specified herein, meet or exceed the specifications, and comply with Division 1 requirements regarding substitutions to be considered.
   1. Peerless Products, Inc., Shawnee Mission, KS; (800) 279-9999

B. Provide all aluminum windows from a single manufacturer.

2.2 MATERIALS

A. Aluminum: Extruded aluminum shall be 6063-T5 or T6 alloy and tempered.

B. Product: Specifications based on EFCO #2800 projected, non-thermally broken window with one (1) inch insulated glass.

C. Glass: as specified in Section 08 80 00, Glazed Systems.

2.3 FABRICATION

A. General:
   1. All aluminum frame shall have a minimum wall thickness of 0.062 inch. Frame sill members shall have a minimum wall thickness of 0.094 inch.
   2. Depth of frame shall not be less than 4-1/2 inches.
   3. Sizes of windows shall be as shown on drawings.

B. Glazing:
   1. All lites shall be wet glazed with a silicone backbed compound. Dry glazed systems shall not be approved.

C. Finish: Finish all exposed areas of aluminum windows and components with electrolytically deposited color in accordance with Aluminum Association Designation AA-M10-C22-A41. Color shall be Clear Anodized.

PART 3 - EXECUTION

3.1 INSPECTION

A. Job Conditions: Verify that openings are dimensionally within allowable tolerances, plumb, level, clean, provide a solid anchoring surface and are in accordance with approved shop drawings.

3.2 INSTALLATION

A. Use only skilled tradesmen with work performed in accordance with manufacturer's instructions, approved shop drawings and specifications.

B. Plumb and align window faces in a single plane for each wall plane and erect windows and materials square and true. Maximum variation from plumb and level shall not exceed 1/8 inch in ten (10) feet (3 mm in 3 m).

C. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads, as applicable.

D. Adjust windows for proper operation after installation.

E. Furnish and apply sealants to provide a weathertight installation at all joints and intersections and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.

3.3 CLEANING

A. After installation, remove all sealants, caulking, and other misplaced materials from all surfaces, including adjacent work.

B. Thoroughly clean window frames, casings, and glass using materials and methods recommended by the window and glass manufacturer that do not cause defacement of work.

END OF SECTION

SEVTION 08 71 00
DOOR HARDWARE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Hardware for swinging, sliding, and folding doors except special types of unique and non-matching hardware specified in other sections.

1.02 RELATED WORK

A. Section 08 11 00 - Steel Doors and Frames
B. Section 08 21 00 - Flush Wood Doors
C. Section 08 41 00 - Metal Frame Storefronts
D. Division 26 – Electrical
E. Division 28 – Fire Alarm/Detection

1.03 REFERENCES

A. ADA - Americans with Disabilities Act of 1990 including Accessibility Guidelines as amended by the D.O.J. September 15, 2010, as adopted by the Authority Having Jurisdiction (AHJ).
B. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
C. ANSI/BHMA A156 (.1 through .21)
D. ANSI/DHI – A115.IG Installation Guide for Doors and Hardware.
E. FEMA P-361 – Safe Rooms for Tornados and Hurricanes.
F. NFPA 80 - Fire Doors and Windows.
G. NFPA 101 – Life Safety Code
H. IBC - International Building Code, as adopted by public Authority Having Jurisdiction (AHJ).
I. State and local Rules and Regulations for Barrier Free Facilities, as adopted by AHJ.

1.04 DOOR HARDWARE TYPES

A. Types of finish hardware required include, but is not necessarily limited to, the following:
   1. Pivot sets and intermediate pivots.
   2. Hinges.
   3. Lock cylinders.
   4. Keys, keying, and key control.
   5. Locksets, latchsets, and privacy sets.
   6. Exit devices.
   7. Closers.
   8. Mullions.
   9. Overhead, wall, and floor stops.
   10. Protection plates.
   11. Gasketing for exterior and interior doors, as required.
   12. Door holders.
   13. Door bottoms.
   14. Thresholds.
   15. Silencers.
B. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware is indicated elsewhere in this section or in the Door Hardware Schedule at the end of this section. Refer to Part 2 Products for Manufacturer's identification and allowable substitutions.

1.05 SUBMITTALS

A. Under provisions of Section 01 34 00, submit the following:
   1. Product information: Manufacturer's published technical product data for all specified door hardware items indicating compliance with the requirements.
   2. Hardware Schedule:
      a. Hardware schedules are intended for the Contractor's coordination of the work. Review and acceptance by the Architect or Owner does not relieve the Contractor of his exclusive responsibility to fulfill the requirements as shown and specified.
      b. Submit hardware schedule in the manner and format as specified, complying with the actual construction progress schedule requirements for each draft. Include the following information:
         1) Explanation of all abbreviations, symbols, codes, at the like, including door handing.
         2) Type, style, function, size, and finish of each hardware item.
         3) Door and frame sizes and materials cross referenced to the Architect's marks in the door schedule.
         4) Room identification (name and number) on each side of door opening as indicated on the drawings.
         5) Product name, model number, description, and name of manufacturer of each item.
         6) Fastenings and other pertinent information.
         7) Locations of hardware cross referenced to architectural floor plans and door schedules.
         8) Mounting heights and locations of each type of hardware.
   3. Key Schedule:
      a. Require qualified representative of the hardware supplier to personally meet with the Owner and obtain the Owner's written key requirements.
      b. Include a separate key schedule, showing clearly how the Owner's instructions on keying of locks has been fulfilled.
   4. Samples: Upon request, submit actual material samples of items indicated as for color selection.
   5. Templates: Hardware supplier will furnish hardware templates to the Contractor for each fabricator of doors, frames, and other work to be shop prepared or factory prepared for the installation of hardware. Upon request check shop drawings of such other work, to conform that adequate provisions are made for proper location and installation of hardware.
   6. All electronic hardware will utilize the manufacturer's "quick clip" wiring system.
   7. Provide electrical operation technical sheets including product schematics, point to point diagrams, and electrical requirements of all electrified hardware. Completely coordinate with the general contractor, electrical engineer, electrician, security access subcontractor and the installer. Operational descriptions are for demonstration only – verify operational intent with the owner, architect and electrical engineer.

B. Under provisions of Section 01 70 00, submit the following:
   1. Product information.
   2. Hardware schedule.
   3. Manufacturer's published operation and maintenance data. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   4. Tools and extra materials as required.
   5. Manufacturer's warranties, revised to meet criteria as established within this section. Warranties shall commence upon acceptance of the building by the owner.
   6. Provide physical samples as requested in writing.

1.06 QUALITY ASSURANCE

A. Acceptable Designs:
   1. Items specified in this section are products which are of acceptable design.
   2. Do not substitute other products without Architect's written prior approval per Section 01600. Requests for approval shall be submitted by factory authorized distributor firms representing the products proposed for substitution.

B. Qualifications:
   1. Manufacturer: Manufacturers named in Part 2 of this section with not less than 5 years experience in manufacturing commercial door hardware of the type indicated.
   2. Hardware Supplier:
      a. A recognized architectural finish hardware supplier who has been furnishing hardware in the same state as the project for a period of not less than 5 years.
      b. Hardware supplier's organization shall include an experienced Architectural Hardware Consultant (AHC), certified by the Door and Hardware Institute (DHI), who is physically available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor. Mail or telephone correspondence is not acceptable.
      c. Hardware supplier shall have local warehousing facilities and shall maintain an adequate parts inventory of items supplied for future service to the owner. Supplier will be a factory authorized distributor of all hardware specified.
   3. Installer: Company specializing in installing work of this section with not less than 3 years experience and acceptable to the manufacturer and the hardware supplier. Maintain regular work force of qualified personnel, trained, skilled, and experienced in installing door hardware and constant, competent supervision. The hardware installer shall meet with the representatives of the general contractor and hardware supplier to jointly inventory all hardware items. Upon satisfactory inventory of products, the hardware installer accepts responsibility for all hardware items inventoried.

C. Regulatory Requirements:
   1. Provide hardware for fire rated openings, whether specified or not, in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels. Label hardware, as required, for compliance with pressure testing criteria as dictated in IBC.
   2. Provide hardware which meets or exceeds handicap accessibility per local building code requirements. Conform to the Americans with Disabilities Act (ADA) of 1990 as amended by the D.O.J. September 15, 2010, as adopted by the Authority Having Jurisdiction (AHJ).
   3. If applicable, meet all requirements as directed by the D.O.H. (Department of Health).

D. Warranties:
   1. Provide warranty periods that meet or exceed periods noted. Manufacturers that do not meet the required warranty periods shall supply a written statement on the manufacturer’s letterhead that the products will be warranted for the required period. All warranty periods commence upon the date of Owner’s occupancy with no exceptions.

1.07 DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Deliver, store, handle, and protect products to project site under provisions of Section 01 60 00 and as specified herein.

B. Require hardware supplier to:
   1. Tag each item or package separately, with identification related to final hardware schedule.
   2. Include manufacturer's basic installation instructions with each item or package.
   3. As material is received by hardware supplier from various manufacturers, sort and repackage in containers with each item clearly marked with appropriate opening numbers to match the approved hardware schedule. Two or more identical items may be packed in the same container.

4. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.
5. Inventory hardware jointly with representatives of the general contractor, hardware supplier and the hardware installer until each is satisfied that count is correct. Refer to paragraph 1.6-B-3.

C. Protect hardware from theft by cataloging and storing in a secure and lockable area. Control the handling and installation of hardware items which are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation. Replace lost, missing, damaged, or stolen door hardware items at no additional cost to the Owner as required to meet schedule requirements.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate work of this section with the work of other sections of work.
B. Furnish hardware templates to each fabricator of doors, frames, and other work to be shop or factory prepared for the installation of hardware.
C. Verify completeness and suitability of door hardware with the hardware supplier and the hardware installer.

1.09 MAINTENANCE MATERIALS

A. Furnish to Owner a complete set of special wrenches and tools applicable to each different or special hardware component as needed for Owner's continued adjustment, maintenance, removal, and replacement of door hardware.
B. Tools and accessories shall be supplied by the hardware component manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS AND FABRICATION

A. General:
   1. Provide all door hardware for complete work, in accordance with the drawings and as specified herein.
   2. Quantities listed, in any instance, are for the Contractor's convenience only and are not guaranteed.
   3. Provide items and quantities not specifically mentioned to ensure a proper and complete operational installation. Match the quality and finish of items specified.
   4. Provide miscellaneous hardware as listed in hardware groups.
B. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Door schedule indicates door and frame sizes, materials, required fire ratings, and other pertinent information. Furnish each item of hardware for proper installation and operation of door movement as indicated.
C. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable name plates), except in conjunction with required UL or FM labels and as otherwise acceptable to the Architect. Manufacturer's identification will be permitted on rim of lock cylinders and latch faceplates only.
D. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
E. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self tapping sheet metal screws, except as specifically indicated.

1. Screws: Furnish screws for installation, with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finishes of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
2. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

2.02 HINGES

A. Manufacturer:
   1. Listed in Door Hardware Schedule: Stanley
   2. Substitutions: Hager, McKinney, Ives
B. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template produced units.
C. Screws: Furnish Phillips flat head or machine screws for installation of units, except furnish Phillips flat head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges.
D. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   1. Steel Hinges: Steel pins.
   2. Non-ferrous Hinges: Stainless steel pins.
   3. All doors: Non-removable pins.
E. Pin Tips: Flat button and matching plug, finished to match leaves.
F. Number of Hinges: Provide number of hinges indicated, but not less than 3 hinges per door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.
G. Butt type hinges are to be warranted for a period of five years.

2.03 LOCK CYLINDERS

A. Manufacturer:
   1. Listed in Door Hardware Schedule: Schlage Keyway to match existing
   2. Substitutions: Schlage Keyway to match existing.
B. All lock cylinders shall be equipped with 6-pin conventional to match existing. Provide construction keying for the construction period.
C. Construct lock cylinder parts from brass/bronze, stainless steel, or nickel silver.

2.04 KEYS, KEYING, AND KEY CONTROL

A. Keys:
   1. Material: Provide keys of nickel silver only.
   2. Quantities: These quantities are to establish a maximum allowable quantity of cut keys to service the project and may not necessarily be assigned as noted. A lesser quantity of cut keys required will not result in any credits, nor a quantity of uncut keys to be issued unless noted otherwise.
      a. 3 change keys per each cylinder unit.
      b. 4 master keys per master.
      c. 2 grandmaster keys.
      f. 10 construction keys.
   3. Deliver keys to the Owner's representative: Send masterkeys to the Owner via U.S. registered mail direct from hardware supplier or manufacturer.
B. Keying:
   1. Comply with Owner's written instructions for masterkeying and, except as otherwise indicated, provide individual change keys for each lock which is not designated to be keyed alike with a group of related locks.

2. Grandmaster key all cylinder items to coordinate with the Owner's instructions and the Schlage Conventional masterkey system. Allow for expansion. Permanently inscribe each key with the notation "DO NOT DUPLICATE".

C. Key Control:
1. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by the system manufacturer, with capacity for 150% of the number of locks required for the project.
2. Provide a hinged panel type cabinet, for wall mounting, Telkee AWC-150S or equal.
3. Provide cylinder units with concealed key control and keys with visual key control.

2.05 LOCKSETS, LATCHSETS, AND PRIVACY SETS:

A. Manufacturer:
1. Listed in Door Hardware Schedule: Best 9K
2. Substitutions: Schlage

B. Types: Locksets, latchsets, and privacy sets as indicated in Door Hardware Schedule.

C. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt. Provide dust-proof strikes for foot bolts, except where not available. At these locations, provide manufacturer's standard recessed strike. Provide roller type strikes where recommended by lock, latch or bolt manufacturer. If aluminum frames are specified, confirm with the aluminum frame supplier that the standard lock strikes will function. Provide the manufacturer’s standard extended lip strikes if required.

D. Lock Throw: Provide 3/4" minimum throw of mortise type latches and deadbolts. Provide 5/8” throw of cylindrical type latches. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

E. Locks and latches shall be warranted for a period of five years.

2.06 EXIT DEVICES AND MULLIONS

A. Manufacturer:
1. Listed in Door Hardware Schedule: Precision
2. Substitutions: Detex, Von Duprin

B. Provide risers, as needed, to prevent interference with door glazing kits.

C. Provide spacers as needed for proper application of removable mullions on narrow stop type frames.

D. Exit devices and related hardware shall be warranted for a period of five years.

2.07 CLOSERS

A. Manufacturer:
1. Listed in Door Hardware Schedule: Stanley QDC
2. Substitutions: LCN 4040-DEL, Norton 7500 DA

B. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending on the size of the door, exposure to weather and anticipated frequency of use.

C. Provide manufacturer's standard through bolt attachment at all applications.

D. Arms:
1. Provide parallel arms for all overhead closers, except as otherwise indicated. Provide drop plates as needed to prevent glazing interference.

E. Mount all closers to the maximum allowable degree of opening by the closer manufacturer's template. Where closer arms incorporate dead stop features, mount closers to the maximum degree of opening available before conflict with adjacent structures. If not apparent on the contract documents, verify the use of open space with the Architect or Owner's Representative to determine the maximum allowable degree of opening.

F. Access Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force. Fire protection has precedence over handicap compatibility, check with local jurisdiction.
G. Door closers and related hardware shall be warranted for a period of ten years.

2.08 WALL, FLOOR AND OVERHEAD STOPS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Trimco
   2. Substitutions: Rockwood, Hager
   3. Overhead stops will be as manufactured by ABH. Equal products by Rixson are acceptable.
B. General: Except as otherwise indicated, provide stops (wall, floor or overhead) at each leaf of every swinging door leaf.
C. Import products lesser in quality than the specified items are not acceptable.

2.09 PROTECTION PLATES

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Trimco
   2. Substitutions: Rockwood, Hager, Tice
B. Types: Armor Plates, Kick Plates, Mop Plates
C. Fasteners: Provide manufacturer's standard exposed Phillips head fasteners for door trim units; either machine screws or self tapping sheet metal type screws per manufacturer's recommendations for application to the specified door construction.
D. Sizes: Fabricate protection plates (armor, kick or mop) not more than 2" less than door width on stop side and not more than 1" less than door width on pull side, x the height indicated.
F. Metal Plates: Stainless Steel, 18 gauge (0.050) thick. Satin finish, US32D (630), beveled four edges (B4E).

2.10 GASKETS AND SWEEPS

A. Manufacturer:
   1. Listed in Door Hardware Schedule: National Guard
   2. Substitutions: Pemko, Reese
B. General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles indicated as drawn or scheduled.
C. Fasteners: Provide non-corrosive fasteners as recommended by the manufacturer for applications indicated.
D. Replaceable seal strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by the manufacturer.
E. Perimeter weatherstripping: Flexible, hollow neoprene bulb or loop insert, conforming to MIL R 6055, Class II, Grade 40. Where two types of perimeter gaskets are specified, apply them not to conflict and per gasket manufacturer’s recommendations.
F. Weatherstripping at Door Bottoms: Provide door bottoms consisting of contact type resilient insert and metal housing of design and size indicated.
G. Hot smoke seal, if required by IBC and subsequent UL testing procedures, will be supplied as an integral part of the door assembly by the door manufacturer.
H. Gaskets and sweeps shall be warranted for a period of three years.

2.11 THRESHOLDS

A. Manufacturer:

1. Listed in Door Hardware Schedule: National Guard
2. Substitutions: Pemko, Reese

B. Except as otherwise indicated provide standard metal threshold unit of type, size and profile as detailed or scheduled. All thresholds will be supplied with the Pemkote abrasive finish unless noted otherwise.
C. Where there is conflict between scheduled thresholds and details, details shall have precedence. Revise details only if necessary to comply with handicap accessibility requirements. Notify the Architect of such required modifications.
D. Verify threshold details or conditions at all openings to ensure that the openings receive proper applications for weather seal or floor transition whether specified or not.
E. Thresholds and related items shall be warranted for a period of three years, abrasive coatings shall be warranted for a period of ten years.

2.12 SILENCERS

A. Manufacturers:
1. Listed in Door Hardware Schedule: Trimco
2. Substitutions: Rockwood, Ives

2.13 FINISHES

A. Exposed surfaces of hardware shall be Brushed Chrome (US26D, 626), unless otherwise indicated. Items specified in Satin Stainless Steel (US32D, 630) shall be supplied in stainless steel with no exceptions.
B. The designations used in the schedule and elsewhere to indicate hardware finishes are the industry recognized standard commercial finishes common to the product's manufacturer listed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine and verify that substrates and project site conditions are ready to receive work of this section.
B. Do not begin installation until finishes indicated to be field applied have been applied to doors, frames, and similar items requiring project site finishing and are thoroughly dry and cured.
C. Do not begin installation until unsatisfactory conditions are corrected in a manner acceptable to the installer. Beginning installation means installer accepts project site conditions and substrates as ready to receive work of this section.

3.02 INSTALLATION

A. General: The types and approximate quantities of door hardware required for this project are indicated at the end of this section.
B. Key Cabinet: Installation will be done by the owner.
C. Heights: Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Architect.
D. Substrates: Adjust and reinforce attachment substrates as necessary for proper installation and operation of hardware.
E. Installation:
1. Install each hardware item in compliance with the manufacturer's instructions, as adopted by local jurisdiction, requirements of NFPA 80, NFPA 101, IBC, ADA, State and local Rules and Regulations for Barrier Free Facilities and recommendations of the DHI.
2. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

3. Drill and countersink units which are not factory prepared for fasteners. Space fasteners and anchors in accordance with industry standards.
4. Where not factory machined, machine cut for hardware per template, as required.
5. Cut and fit thresholds and floor covers to profile of door frames. Join units with concealed welds. Cut smooth openings for spindles, bolts, or similar items. Screw thresholds to substrate with the manufacturer's standard flat head sleeve anchor (FHSL), 1/4-20 x 2" unless noted otherwise. Fill cavities of thresholds at sound rated openings with 1 inch thick (uncompressed thickness) low density fiberglass sill sealer insulation full width and length of the threshold. In addition to fastening requirements, set thresholds for exterior doors in a full bed of butyl-rubber or polyisobutylene mastic sealant.
6. Do not install hardware which is incomplete or apparently improper for application. Notify the hardware supplier immediately of any such deficiencies. Failure to comply with this requirement indicates the hardware installer's acceptance of responsibility for proper application and performance.

F. Cutting and Patching:
Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections.

G. Where new hardware is to be installed on existing doors, prepare the door/frame to accept the new hardware and allow proper operation.

H. Where electronics are specified for integration with the security access system, operation notes are for opening options that may or may not be utilized by the owner. Consult with the owner and security access subcontractor for final operation parameters.

3.03 ADJUSTING

A. Initial Adjustment:
1. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Adjust resilient faced sound stops for continuous contact with door and threshold. Adjust weatherstripping and sweeps to completely seal doors with frames and to adjacent structures.
2. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.04 DEMONSTRATION

A. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.05 CLEANING AND DEBRIS

A. Cleaning:
1. Clean work upon installation.
2. Clean adjacent surfaces soiled by work of this section.

B. Debris: Remove debris from project site and legally dispose of off-site.

3.06 MAINTENANCE

A. Approximately six months after the acceptance of hardware in each area, the hardware installer shall:

1. Return to the project and re-adjust every item of hardware to restore proper function of doors and hardware.
2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
3. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units.
4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware and submit to the Architect.

3.07 PROTECTION

A. Protect work of this section as required so that work will be without damage or deterioration at the time of completion and acceptance by the Owner.

3.08 DOOR HARDWARE SCHEDULE

Manufacturer's Abbreviations

BE	Best Access Systems	Locks, Latches, Cylinders
NA	National Guard	Gaskets, Weatherstrip, Thresholds
PR	Precision	Exit Devices, Power Supplies
ST	Stanley Commercial	Closers, Hinges
TR	Trimco	Stops, Flat Goods

Finish Codes

628	Anodized Aluminum
626, 652	Brushed Chrome
630	Satin Stainless Steel
689	Aluminum Painted

Option List

Code	**Description**
CD	Cylinder Dogging
B4E	Beveled 4 Edges
CS	Counter Sinking of Kick, Armor and Mop Plate Screws
N	"N" Thru Button Mounting
SSMS/EA	Stainless Machine Screws with Expansion Anchors
SMS-TEKS	Self-drilling Screws

SET #1 – Main Entry

Doors: A100

2	Continuous Hinges	661HD	628	ST
1	Removable Mullion	KR822	689	PR
1	Exit Device	2403 CD	630	PR
1	Exit Device	2401 CD	630	PR
2	Mortise Cylinders	20-001	626	SC
2	Rim Cylinders	20-022	626	SC
2	Door Pulls	1191-4 Type N Mounting	630	TR
2	Door Closers	QDC115 x 8Q00471	689	ST
2	Spacer Blocks	P45HD-110	689	ST
2	Angle Brackets	P45HD-112	689	ST
2	Door Stops	1214H	626	TR
1	Mullion Seal	5100 N		NA
2	Door Sweeps	200 NA SMS-TEKS		NA
1	Saddle Threshold	426 E SSMS/EA		NA

Perimeter gaskets by door manufacturer. Verify threshold application.

SET #2 – Restroom – Inswing

Doors: A101, A104

3	Hinges	FBB179 4 1/2 X 4 1/2	652	ST
1	Push Plate	1001-3	630	TR
1	Pull Plate	1018-3	630	TR
1	Door Closer	QDC115	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Mop Plate	KM050 6" x 1" LDW B4E CS	630	TR
1	Wall Stop	1270CVPV	626	TR
1	Perimeter Gasket	5040 B		NA

SET #3 – Unisex Restroom

Doors: A102

3	Hinges	FBB179 4 1/2 X 4 1/2	652	ST
1	Privacy Set	9K3-0L15D	626	BE
1	Door Closer	QDC111	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Mop Plate	KM050 6" x 1" LDW B4E CS	630	TR
1	Wall Stop	1270CVPV	626	TR
1	Perimeter Gasket	5040 B		NA

SET #12 – Mechanical

Door: A103

3	Hinges	FBB179 4 1/2 X 4 1/2	652	ST
1	Lockset	9K3-0D15D SCH	626	BE
1	Closer/Stop	QDC111	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Perimeter Gasket	5040 B		NA

*****END OF SECTION*****

SECTION 08 71 00 - FINISH HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

Hardware for swinging, sliding, and folding doors except special types of unique and non-matching hardware specified in other sections.

1.02 RELATED WORK

A. Section 08 11 10 – Hollow Metal Doors and Frames
B. Section 08 21 11 – Flush Wood Doors
C. Section 08 36 13 – Overhead Sectional Doors
D. Section 08 43 13 – Metal Framed Storefronts
E. Section 08 71 13 – Automatic Operators
F. Division 26 – Electrical

1.03 REFERENCES

A. ADA - Americans with Disabilities Act of 1990 including Accessibility Guidelines as amended by the D.O.J. September 15, 2010, as adopted by the Authority Having Jurisdiction (AHJ).
B. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
C. ANSI/BHMA A156 (.1 through .21)
D. ANSI/DHI – A115.IG Installation Guide for Doors and Hardware.
E. FEMA P-361 – Safe Rooms for Tornados and Hurricanes.
F. NFPA 80 - Fire Doors and Windows.
G. NFPA 101 – Life Safety Code
H. IBC - International Building Code, as adopted by public Authority Having Jurisdiction (AHJ).
I. State and local Rules and Regulations for Barrier Free Facilities, as adopted by AHJ.

1.04 DOOR HARDWARE TYPES

A. Types of finish hardware required include, but is not necessarily limited to, the following:
   1. Pivot sets and intermediate pivots.
   2. Hinges.
   3. Lock cylinders.
   4. Keys, keying, and key control.
   5. Locksets, latchsets, and privacy sets.
   6. Exit devices.
   7. Closers.
   8. Mullions.
   9. Overhead, wall, and floor stops.
   10. Protection plates.
   11. Gasketing for exterior and interior doors, as required.
   12. Door holders.
   13. Door bottoms.
   14. Thresholds.
   15. Silencers.
B. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware is indicated elsewhere in this section or in the Door Hardware Schedule at the end of this section. Refer to Part 2 Products for Manufacturer's identification and allowable substitutions.

1.05 SUBMITTALS

A. Under provisions of Section 01 34 00, submit the following:
   1. Product information: Manufacturer's published technical product data for all specified door hardware items indicating compliance with the requirements.
   2. Hardware Schedule:
      a. Hardware schedules are intended for the Contractor's coordination of the work. Review and acceptance by the Architect or Owner does not relieve the Contractor of his exclusive responsibility to fulfill the requirements as shown and specified.
      b. Submit hardware schedule in the manner and format as specified, complying with the actual construction progress schedule requirements for each draft. Include the following information:
         1) Explanation of all abbreviations, symbols, codes, at the like, including door handing.
         2) Type, style, function, size, and finish of each hardware item.
         3) Door and frame sizes and materials cross referenced to the Architect's marks in the door schedule.
         4) Room identification (name and number) on each side of door opening as indicated on the drawings.
         5) Product name, model number, description, and name of manufacturer of each item.
         6) Fastenings and other pertinent information.
         7) Locations of hardware cross referenced to architectural floor plans and door schedules.
         8) Mounting heights and locations of each type of hardware.
   3. Key Schedule:
      a. Require a qualified representative of the hardware supplier to personally meet with the Owner and Architect to obtain the Owner's written key requirements.
      b. Include a separate key schedule, showing clearly how the Owner's instructions on keying of locks has been fulfilled.
   4. Samples: Upon request, submit actual material samples of items indicated as for color selection.
   5. Templates: Hardware supplier will furnish hardware templates to the Contractor for each fabricator of doors, frames, and other work to be shop prepared or factory prepared for the installation of hardware. Upon request check shop drawings of such other work, to conform that adequate provisions are made for proper location and installation of hardware.
   6. Provide electrical operation technical sheets including product schematics, point to point diagrams, and electrical requirements of all electrified hardware. Completely coordinate with the general contractor, electrical engineer, electrician, security access subcontractor and the installer. Operational descriptions are for demonstration only – verify operational intent with the owner, architect and electrical engineer.
B. Under provisions of Section 01 70 00, submit the following:
   1. Product information.
   2. Hardware schedule.
   3. Manufacturer's published operation and maintenance data. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   4. Tools and extra materials as required.
   5. Manufacturer's warranties, revise to meet criteria as established within this section. Warranty periods shall commence upon acceptance of the building by the owner. Where warranties listed exceed the manufacturer’s standard warranty, obtain in writing an extended warranty to meet the requirements above and as noted. If the manufacturer will not meet these requirements, and another approved manufacturer will comply, supply the alternate approved manufacturer.

1.06 QUALITY ASSURANCE

A. Acceptable Designs:
   1. Items specified in this section are products which are of acceptable design.
   2. Do not substitute products without Architect's written prior approval per Section 01 60 00. Requests for approval shall be submitted by factory authorized distributor firms representing the products proposed for substitution. Items that are noted to allow no substitution are matching existing materials and the owner's material inventory for servicing the facility.

B. Qualifications:
   1. Manufacturer: Manufacturers named in Part 2 of this section with not less than 5 years experience in manufacturing commercial door hardware of the type indicated.
   2. Hardware Supplier:
      a. A recognized architectural finish hardware supplier who has been furnishing hardware in the same state as the project for a period of not less than 5 years.
      b. Hardware supplier's organization shall include an experienced Architectural Hardware Consultant (AHC), certified by the Door and Hardware Institute (DHI), who is physically available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor. Mail or telephone correspondence is not acceptable.
      c. Hardware supplier shall have local warehousing facilities and shall maintain an adequate parts inventory of items supplied for future service to the owner. Supplier will be a factory authorized distributor of all hardware specified.
   3. Installer: Company specializing in installing work of this section with not less than 5 years experience and acceptable to the manufacturers and the hardware supplier. Maintain regular work force of qualified personnel, trained, skilled, and experienced in installing door hardware and constant, competent supervision per the requirements of the General Contractor. The hardware installer shall meet with the representatives of the General Contractor and hardware supplier to jointly inventory all hardware items. Upon satisfactory inventory of products, the hardware installer accepts responsibility for all hardware items inventoried.

C. Regulatory and Operational Requirements:
   1. Provide hardware for all openings, whether specified or not, in compliance with NFPA Standard No. 80, proper operation and local building code requirements. Where required, provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels. Label hardware, as required, for compliance with pressure testing criteria as dictated in IBC.
   2. Provide hardware which meets or exceeds handicap accessibility per local building code requirements. Conform to the Americans with Disabilities Act (ADA) of 1990 as amended by the D.O.J. September 15, 2010, as adopted by the Authority Having Jurisdiction (AHJ).

1.07 DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Deliver, store, handle, and protect products to project site under provisions of Section 01 60 00 and as specified herein.

B. Require hardware supplier to:
   1. Tag each item or package separately, with identification related to final hardware schedule.
   2. Include manufacturer's basic installation instructions with each item or package.
   3. As material is received by hardware supplier from various manufacturers, sort and repackage in containers with each item clearly marked with appropriate opening numbers to match the approved hardware schedule. Two or more identical items may be packed in the same container.
   4. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

5. Inventory hardware jointly with representatives of the General Contractor, hardware supplier and the hardware installer until each is satisfied that count is correct. Refer to paragraph 1.6-B-3.

C. Protect hardware from theft by cataloging and storing in a secure and lockable area. Control the handling and installation of hardware items which are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation. Replace lost, missing, damaged, or stolen door hardware items at no additional cost to the Owner as required to meet schedule requirements.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate work of this section with the work of other sections of work under provisions of Section 01 04 00
B. Furnish hardware templates to each fabricator of doors, frames, and other work to be shop or factory prepared for the installation of hardware.
C. Verify completeness and suitability of door hardware with the hardware supplier and the hardware installer.

1.09 MAINTENANCE MATERIALS

A. Under provisions of Section 01 70 00, furnish to Owner a complete set of special wrenches and tools applicable to each different or special hardware component as needed for Owner's continued adjustment, maintenance, removal, and replacement of door hardware.
B. Special tools and accessories shall be supplied by the hardware component manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS AND FABRICATION

A. General:
   1. Provide all door hardware for complete work, in accordance with the drawings and as specified herein.
   2. Quantities listed, in any instance, are for the Contractor's convenience only and are not guaranteed.
   3. Provide items and quantities not specifically mentioned to ensure a proper and complete operational installation. Match the quality and finish of items specified.
   4. Provide miscellaneous hardware as listed in hardware groups.
B. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Door schedule indicates door and frame sizes, materials, required fire ratings, and other pertinent information. Furnish each item of hardware for proper installation and operation of door movement as indicated.
C. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable name plates), except in conjunction with required UL or FM labels and as otherwise acceptable to the Architect. Manufacturer's identification will be permitted on rim of lock cylinders and latch faceplates only.
D. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
E. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

1. Screws: Furnish screws for installation, with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finishes of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
2. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

2.02 HINGES

A. Manufacturer:
   1. Listed in Door Hardware Schedule: Stanley
   2. Approved Substitutions: Hager, PBB or approved equals prior to bidding
   3. Continuous hinges are as manufactured by Stanley. Equal products by Select or ABH are acceptable.
B. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template produced units.
C. Screws: Furnish Phillips flat head or machine screws for installation of units, except furnish Phillips flat head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges.
D. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   1. Steel Hinges: Steel pins.
   2. Non-ferrous Hinges: Stainless steel pins.
   3. Exterior doors: Non-removable pins.
   4. Reverse bevel interior doors (lockable): Non-removable pins.
   5. Interior doors: Non-rising pins.
E. Pin Tips: Flat button and matching plug, finished to match leaves.
F. Number of Hinges: Provide number of hinges indicated, but not less than 3 hinges per door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.
G. Butt type hinges and continuous hinges are to be warranted for a period of two years.

2.03 LOCK CYLINDERS

A. Manufacturer:
   1. Listed in Door Hardware Schedule: Best
   2. Approved Substitutions: Schlage, Stanley, Allegion, Falcon, or approved Equal
B. Equip locks with 7-pin cylinders for small format interchangeable core pin tumbler inserts with brass construction cores for use during the construction phases. Temporary construction cores shall be removed upon installation of the permanent key system by the owner and returned to the hardware supplier.
C. Construct lock cylinder parts from brass/bronze, stainless steel, or nickel silver.

2.04 KEYS, KEYING, AND KEY CONTROL

A. Keys:
   1. Material: Provide keys of nickel silver only.
   2. Quantities: These quantities are to establish a maximum allowable quantity of cut keys to service the project and may not necessarily be assigned as noted. A lesser quantity of cut keys required will not result in any credits, nor a quantity of uncut keys to be issued unless noted otherwise.
      a. 3 change keys per each cylinder unit.

b. 4 master keys per master.
c. 2 control keys
d. 2 construction control keys
e. 10 construction keys.

3. Deliver keys to the Owner's representative: Send masterkeys to the Owner via U.S. registered mail direct from hardware supplier or manufacturer.

B. Keying:
1. Comply with Owner's written instructions for masterkeying and, except as otherwise indicated, provide individual change keys for each lock which is not designated to be keyed alike with a group of related locks.
2. Grandmaster key all cylinder items to coordinate with the Owner's instructions. Allow for expansion. Permanently inscribe each key with the notation "DO NOT DUPLICATE".

C. Key Control:
1. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by the system manufacturer, with capacity for 150% of the number of locks required for the project.
2. Provide a hinged panel type cabinet, for wall mounting, Telkee RWC-75S or equal.
3. Provide cylinder units with concealed key control and keys with visual key control.

2.05 LOCKSETS, LATCHSETS, AND PRIVACY SETS:

A. Manufacturer:
1. Listed in Door Hardware Schedule: Best 9K
2. Approved Substitutions: Schlage, Stanley, Allegion, Falcon, or approved Equal

B. Types: Locksets, latchsets, and privacy sets as indicated in Door Hardware Schedule.

C. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt. Provide dust-proof strikes for foot bolts, except where not available. At these locations, provide manufacturer's standard recessed strike. Provide roller type strikes where recommended by lock, latch or bolt manufacturer. If aluminum frames are specified, confirm with the aluminum frame supplier that the standard lock strikes will function. Provide the manufacturer’s standard extended lip strikes if required.

D. Lock Throw: Provide 3/4" minimum throw of mortise type latches and deadbolts used. Cylindrical latches will be 1/2" minimum. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

E. Levers shall be cast solid brass, bronze or stainless steel. Wrought hollow levers are not acceptable.

F. Locks and latches shall be warranted for a period of five years.

2.06 EXIT DEVICES AND MULLIONS

A. Manufacturer:
1. Listed in Door Hardware Schedule: Precision 2000
2. Approved Substitutions: Sargent 8800, Dorma 9000 or approved equals prior to bidding

B. Provide risers, as needed, to prevent interference with door glazing kits.

C. Provide spacers as needed for proper application of removable mullions on narrow stop type frames.

D. Devices will be architecturally finished as specified. Powder coat finish will not be allowed.

E. Exit devices and related hardware shall be warranted for a period of five years.

2.07 CLOSERS:

A. Manufacturer:
1. Listed in Door Hardware Schedule: Stanley QDC 100 Series
2. Approved Substitutions: LCN 4040 XP DEL Series, Dorma 8916-DA Series,

B. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending on the size of the door, exposure to weather and anticipated frequency of use.
C. Provide manufacturer's standard through bolt attachment where door construction is not adequate for support.
D. Arms:
   1. Provide parallel arms for all overhead closers, except as otherwise indicated. Provide drop plates as needed to prevent glazing interference.
E. Mount all closers to the maximum allowable degree of opening by the closer manufacturer's template. Where closer arms incorporate dead stop features, mount closers to the maximum degree of opening available before conflict with adjacent structures. If not apparent on the contract documents, verify the use of open space with the Architect or Owner's Representative to determine the maximum allowable degree of opening.
F. Access Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force. Fire protection has precedence over handicap compatibility, check with local jurisdiction.
G. Provide closers with the manufacturer's standard adjustable delayed closing feature.
H. Door closers and related hardware shall be warranted for a period of twenty-five years. Electronic closers shall be warranted for a period of two years.

2.08 WALL AND FLOOR STOPS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Trimco
   2. Approved Substitutions: Hager, Rockwood
B. General: Except as otherwise indicated, provide stops (wall, floor or overhead) at each leaf of every swinging door leaf.

2.09 PROTECTION PLATES

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Trimco
   2. Approved Substitutions: Hager, Rockwood or approved equals prior to bidding
B. Types: Armor Plates, Kick Plates, Mop Plates
C. Fasteners: Provide manufacturer's standard exposed Phillips head fasteners for door trim units; either machine screws or self-tapping sheet metal type screws per manufacturer's recommendations for application to the specified door construction.
D. Sizes: Fabricate protection plates (armor, kick or mop) not more than 2" less than door width on stop side and not more than 1" less than door width on pull side, x the height indicated.
E. Metal Plates: Stainless Steel, 18 gauge (0.050) thick. Satin finish, US32D (630), beveled four edges (B4E).

2.10 GASKETS AND SWEEPS

A. Manufacturer:
   1. Listed in Door Hardware Schedule: National Guard
   2. Approved Substitutions: Reese, Hager or approved equals prior to bidding
B. General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles indicated as drawn or scheduled.
C. Fasteners: Provide non-corrosive fasteners as recommended by the manufacturer for applications indicated.
D. Replaceable seal strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by the manufacturer.

E. Perimeter weatherstripping: Flexible, hollow neoprene bulb or loop insert, conforming to MIL R 6055, Class II, Grade 40.
F. Weatherstripping at Door Bottoms: Provide door bottoms consisting of contact type resilient insert and metal housing of design and size indicated.
G. Hot smoke seal, if required by IBC and subsequent UL testing procedures, will be supplied as an integral part of the door assembly by the door manufacturer.
H. Gaskets and sweeps shall be warranted for a period of three years.

2.11 THRESHOLDS

A. Manufacturer:
   1. Listed in Door Hardware Schedule: National Guard
   2. Approved Substitutions: Reese, Hager or approved equals prior to bidding
B. Except as otherwise indicated provide standard metal threshold unit of type, size and profile as detailed or scheduled.
C. Where there is conflict between scheduled thresholds and details, details shall have precedence. Revise details only if necessary to comply with handicap accessibility requirements. Notify the Architect of such required modifications.
D. Verify all existing conditions and revise if necessary. All thresholds must be within ADA parameters. Notify the Architect of required revisions if applicable.
E. Thresholds and related items shall be warranted for a period of three years, abrasive coatings shall be warranted for a period of ten years.

2.12 SILENCERS

A. Manufacturers:
   1. Listed in Door Hardware Schedule: Trimco
   2. Approved Substitutions: Rockwood, Ives

2.13 FINISHES

A. Exposed surfaces of hardware shall be Brushed Chrome (US26D, 626, 652), unless otherwise indicated. Items specified in Satin Stainless Steel (US32D, 630) shall be supplied in stainless steel with no exceptions.
B. The designations used in the schedule and elsewhere to indicate hardware finishes are the industry recognized standard commercial finishes common to the product's manufacturer listed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Under provisions of Section 01 04 00, examine and verify that substrates and project site conditions are ready to receive work of this section.
B. Do not begin installation until finishes indicated to be field applied have been applied to doors, frames, and similar items requiring project site finishing and are thoroughly dry and cured.
C. Do not begin installation until unsatisfactory conditions are corrected in a manner acceptable to the installer. Beginning installation means installer accepts project site conditions and substrates as ready to receive work of this section.

3.02 INSTALLATION

A. General: The types and approximate quantities of door hardware required for this project are indicated at the end of this section.
B. Key Cabinet: Install in location as indicated on drawings or as directed by the Architect.

C. Heights: Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for /standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Architect.
D. Substrates: Adjust and reinforce attachment substrates as necessary for proper installation and operation of hardware.
E. Installation:
   1. Install each hardware item in compliance with the manufacturer's instructions, requirements of NFPA 80, NFPA 101, IBC, ADA, State Rules and Regulations for Barrier Free Facilities and recommendations of the DHI.
   2. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
   3. Drill and countersink units which are not factory prepared for fasteners. Space fasteners and anchors in accordance with industry standards.
   4. Where not factory machined, machine cut for hardware per template, as required.
   5. Cut and fit thresholds and floor covers to profile of door frames. Join units with concealed welds. Cut smooth openings for spindles, bolts, or similar items. Screw thresholds to substrate with the manufacturer's standard machine screws and expansion anchors unless otherwise noted. Fill cavities of thresholds at sound rated openings with 1 inch thick (uncompressed thickness) low density fiberglass sill sealer insulation full width and length of the threshold. In addition to fastening requirements, set thresholds for exterior doors in a full bed of butyl-rubber or polyisobutylene mastic sealant.
   6. Do not install hardware which is incomplete or apparently improper for application. Notify the hardware supplier immediately of any such deficiencies. Failure to comply with this requirement indicates the hardware installer's acceptance of responsibility for proper application and performance.
F. Cutting and Patching:
   Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections.
G. Where existing components are to receive new hardware, prepare the existing component to accept the new hardware as specified. If the existing component cannot be fabricated to accept the new hardware, or if the revisions will result in a voided label, immediately contact the architect for direction.

3.03 ADJUSTING

A. Initial Adjustment:
   1. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Adjust resilient faced sound stops for continuous contact with door and threshold. Adjust weatherstripping and sweeps to completely seal doors with frames and to adjacent structures.
   2. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.04 DEMONSTRATION

Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.05 CLEANING AND DEBRIS

A. Cleaning:
   1. Clean work under provisions of Section 01 70 00
   2. Clean adjacent surfaces soiled by work of this section.
B. Debris: Under provisions of Section 01 50 00, remove debris from project site and legally dispose of off-site.

3.06 MAINTENANCE

A. Approximately six months after the acceptance of hardware in each area, the hardware installer shall:
   1. Return to the project and re-adjust every item of hardware to restore proper function of doors and hardware.
   2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
   3. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units.
   4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware and submit to the Architect.

3.07 PROTECTION

Under provisions of Section 01 50 00, protect work of this section as required so that work will be without damage or deterioration at the time of completion and acceptance by the Owner.

3.08 DOOR HARDWARE SCHEDULE

List of Manufacturers

BE	Best Access Systems	Locks, Cylinders
DM	Dorma USA	Electric Strikes, Door Position Switches
NA	National Guard	Weatherstrip, Thresholds
PR	Precision	Exit Devices, Power Supplies
ST	Stanley	Hinges, Closers
TK	Telkee	Key Cabinet
TR	Trimco	Stops, Flat Goods

Finish Codes

Code	**Description**
626, 652	Brushed Chrome
628	Anodized Satin Aluminum
630	Satin Stainless Steel
689	Painted Aluminum
GREY	Grey

Option List

Code	Description
C	Quick Connect Wiring Option (Precision)
LD	Less Dogging (Precision)
MLR	Motorized Latch Retraction (Precision)
TS	Touchbar Monitoring Switch (Precision)
B4E	Beveled 4 Edges – Armor, Kick and Mop Plates (Trimco)
CS	Counter Sinking of Armor, Kick and Mop Plates (Trimco)
N Mounting	Spanner Through Bolt Mounting (Trimco)
MS/EA	Machine Screws/Expansion Anchors (NGP)
SMS-TEKS	Self-Tapping Machine Screws (NGP)

Miscellaneous Hardware – supply the following:

6	Spare Cores	1CX-7 PATD	626	BE
1	Key Cabinet	RWC-75S		TK
1	Knox Box	3200	BLK	KN

SET #1 - Entry - Card Access

Door: 100A

1	Continuous Hinge	661HD EPT	628	ST
*1	Power Transfer	EPT-12C		PR
*1	Exit Device	C MLR TS 2403	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Pull	1191-4 Type N Mounting	630	TR
1	Door Closer/Drop Plate	QDC115 x 8Q00471	689	ST
1	Spacer Block	P45HD-110	689	ST
1	Angle Bracket	P45HD-112	689	ST
1	Door Stop	1214H	626	TR
1	Door Sweep	200 NA SMS-TEKS		NA
1	Saddle Threshold	426 MS/EA		NA
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-12		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR
*1	Door Position Switch	MC4		DM

Card activation momentarily retracts latch and allows access. Card reader by security access. Perimeter gaskets by door manufacturer. Verify threshold application.

SET #2 - Lobby - Card Access

Door: 100B

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	652	ST
1	Lockset	9K3-7R15D PATD	626	BE
*1	Electric Strike	ES96F FSV LM	630	DM
1	Door Closer	QDC115	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR

Card activation momentarily releases strike and allows access. Card reader by security access.

SET #3 - Office

Doors: 101, 103, 104, 106B, 112, 113, 121

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Lockset	9K3-7AB15D PATD	626	BE
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #3A - Office

Door: 102

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Lockset	9K3-7AB15D PATD	626	BE
1	Door Stop	1215CKU	626	TR
3	Door Silencers	1229A	GREY	TR

SET #4 - Storage/Janitor

Doors: 106A, 116, 124

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Lockset	9K3-7D15D PATD	626	BE
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #5 - Office - Fire Rated

Door: 105

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Lockset	9K3-7AB15D PATD	626	BE
1	Door Closer	QDC111 RA	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
1	Gasketing	5040 B		NA

SET #6 - Corridor - Card Access

Door: 107B

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	652	ST
1	Lockset	9K3-7D15D PATD	626	BE
*1	Electric Strike	ES96F FSV LM	630	DM
1	Door Closer	QDC111 RA	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
1	Gasketing	5040 B		NA
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR

Card activation momentarily releases strike and allows access. Card reader by security access.

SET #6A - Garage - Card Access

Doors: 107A, 126C

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	652	ST
1	Lockset	9K3-7D15D PATD	626	BE
*1	Electric Strike	ES96F FSV LM	630	DM
1	Door Closer	QDC115	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Door Stop	1215CKU	626	TR
1	Gasketing	5040 B		NA
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR

Card activation momentarily releases strike and allows access. Card reader by security access.

SET #7 - Restroom

Doors: 108, 109

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Pull Plate	1018-3	630	TR
1	Push Plate	1001-9	630	TR
1	Door Closer	QDC115	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
1	Gasketing	5040 B		NA

SET #8 - Corridor Exit - Card Access

Doors: 110A, 110B

2	Hinges	CB199 4 1/2 X 4 1/2 NRP	630	ST
*1	Electric Hinge	CECB199-12C 4 1/2 x 4 1/2	630	ST
*1	Exit Device	C MLR TS 2103	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Pull	1191-4 Type N Mounting	630	TR
1	Closer/Stop	QDC119	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Drip Cap	16 A FHW SMS-TEKS		NA
1	Gasketing	5040 B		NA
1	Door Sweep	200 NA SMS-TEKS		NA
1	Saddle Threshold	426 MS/EA		NA
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-12		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR
*1	Door Position Switch	MC4		DM

Card activation momentarily retracts latch and allows access. Card reader by security access. Verify threshold application.

SET #9 - Corridor - Card Access

Doors: 111, 123

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Lockset	9K3-7D15D PATD	626	BE
*1	Electric Strike	ES96F FSV LM	630	DM
1	Door Closer	QDC115	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR

Card activation momentarily releases strike and allows access. Card reader by security access.

SET #10 - Conference/Dining

Doors: 114A, 125

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Passage Set	9K3-0N15D	626	BE
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #11 - Conference OS

Door: 114B

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Passage Set	9K3-0N15D	626	BE
1	Door Closer	QDC115	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #12 - Fire Riser

Door: 117

3	Hinges	CB199 4 1/2 X 4 1/2 NRP	630	ST
1	Lockset	9K3-7D15D PATD	626	BE
1	Lock Guard	5002	630	TR
1	Closer/Stop	QDC119	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Drip Cap	16 A FHW SMS-TEKS		NA
1	Gasketing	120 NA SMS-TEKS		NA
1	Door Sweep	200 NA SMS-TEKS		NA
1	Saddle Threshold	426 MS/EA		NA
*1	Door Position Switch	MC4		DM
	Verify threshold application.			

SET #13 - Restroom

Doors: 118, 119

3	Hinges	CB179 4 1/2 X 4 1/2	652	ST
1	Privacy Set	9K3-0L15D	626	BE
1	Door Closer	QDC111 RA	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Mop Plate	KM050 6" x 1" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
1	Gasketing	5040 B		NA

SET #14 - Electrical

Door: 120

3	Hinges	CB168 4 1/2 X 4 1/2 NRP	652	ST
1	Exit Device	2103 X 1703C LD	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Closer/Stop	QDC119	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Gasketing	5040 B		NA

SET #15 - IT - Card Access

Door: 122

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	652	ST
1	Lockset	9K3-7D15D PATD	626	BE
*1	Electric Strike	ES96F FSV LM	630	DM
1	Door Closer	QDC115	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Wall Bumper	1270WV	630	TR
1	Gasketing	5040 B		NA
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR

Card activation momentarily releases strike and allows access. Card reader by security access.

SET #16 - Entry - Card Access

Doors: 126A, 127A, 127H

3	Hinges	CB199 4 1/2 X 4 1/2 NRP	630	ST
1	Lockset	9K3-7D15D PATD	626	BE
*1	Electric Strike	ES96F FSV LM	630	DM
1	Lock Guard	5002	630	TR
1	Closer/Stop	QDC119	689	ST
1	Kick Plate	K0050 10" x 2" LDW B4E CS	630	TR
1	Drip Cap	16 A FHW SMS-TEKS		NA
1	Gasketing	120 NA SMS-TEKS		NA
1	Door Sweep	200 NA SMS-TEKS		NA
1	Saddle Threshold	426 MS/EA		NA
*1	Wire Harness	WH-6E		ST
*1	Wire Harness	WH-192		ST
*1	Power Supply	RPSMLR2		PR
*1	Door Position Switch	MC4		DM

Card activation momentarily releases strike and allows access. Card reader by security access. Verify threshold application.

SET #17 - Overhead Door

Doors: 126B, 127B, 127C, 127D, 127E, 127F, 127G

1	Mortise Cylinder	1E-74 PATD	626	BE

Balance by motorized door manufacturer.

SET #17A - Chain Link

Doors: 126D, 126E

1	Padlock	41B-722L PATD M5	626	BE

Balance by chain link enclosure manufacturer.

* Requires electronic coordination

End of Section

SECTION 08 73 00

DOOR THRESHOLDS AND SEALS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Door thresholds and seals which are shown on the drawings, or required and which are not specified in Section 08 71 00, Finish Hardware. If a conflict occurs between the information in this Section and that specified in Section 08 71 00, Finish Hardware, the information in Section 08 71 00, Finish Hardware takes precedence. Refer items in conflict or of uncertainty to Architect for clarification prior to start of work.

PART 2 - SUBMITTALS

2.1 ACCEPTABLE MANUFACTURER

A. Specifications are based on named products. If not named, products of manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
   1. National Guard Products, Inc., Memphis, TN (800) 647-7874
   2. Pemko Manufacturing. Co., Ventura, CA (800) 283-9988
   3. Reese Enterprises, Inc., Rosemount, MN (800) 328-0953
   4. Zero International, Inc., Bronx, NY (800) 635-5335

2.2 MATERIALS

A. Thresholds at all exterior door pairs shall be National Guard Products Design No. 814SS x width of door frame plus one (1) inch or equal (solid stainless steel, 1/4 inch thick).

B. Thresholds at single exterior doors. All Thresholds shall be National Guard Products Design No. 882 or equal (1/2 inch maximum rise for handicapped compliance).

C. Sound seals at Interior Doors:
   1. Automatic Door Bottom: No. 335N aluminum finish and mortised. Use at all wood doors scheduled to receive sound strips.
   2. Head and Jamb: No. 103N. Use at all wood and metal doors scheduled to receive soundstrips.
   3. Astragal Seal: No. 116N. Use at all interior double doors scheduled to receive sound strips.
   4. Door Bottom: No. 225N. Use at hollow metal interior doors.

D. Light seals at Interior Doors:
   1. Automatic Door Bottom: No. 335N aluminum finish and mortised. Use at all wood doors scheduled to receive light seals.
   2. Head and Jamb: No. 133NS. Use at all wood doors scheduled to receive light seals.

E. Rain Drip at Exterior Doors:
1. Rain drip cap at top of door frame shall be No. 16AD.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All items shall be installed in accordance with manufacturer's printed instructions.

B. Thresholds and Weatherstrips: Install to provide weathertight and installation. Where used as light seals install for light tight installation. Install threshold the full width of the opening. Set in sealant.

END OF SECTION

SECTION 08 80 00

GLAZED SYSTEMS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exterior and interior glass

B. Glazing Sealant

C. Aluminum framing systems, including storefront

D. Aluminum and glass entry doors

E. Glazing of hollow metal doors.

F. Glazing of wood doors.

G. Ticket window

1.2 RELATED WORK

A. Section 08 11 13 - Hollow Metal Doors and Frames

B. Section 08 14 36 - Wood Doors

C. Section 08 71 00 - Finish Hardware

D. Section 07 92 00 – Building Sealants – sealing adjacent construction materials

1.3 REFERENCES

A. American Architectural Manufacturers Association
   1. AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site
   2. AAMA/NWWDA 101/I.S.2, Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors2.
   3. AAMA 502, Voluntary Specification for Field Testing of Windows and Sliding Glass Doors
   4. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum
   5. AAMA 2604, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

B. American National Standards Institute (ANSI)
   1. Z97.1, Safety Performance Specification
   2. Z97.1, Safety Glass Code

C. ASTM International (ASTM)

1. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
2. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
3. B210, Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
4. B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
5. B308, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
6. C509, Standard Specification for Cellular Elastomeric Preformed Gasket and Sealing Material
7. C1036, Standard Specification for Flat Glass
8. E283, Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
9. E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
10. E331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
11. E547, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential
12. E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

D. American Welding Society (AWS)

E. Federal Specification (FS)
1. DD-G-001403 B
2. T-G-410, Sash putty
3. TT-C-494, Bituminous Paint
4. TT-S-00230, Sealing Compound: Synthetic Rubber Base and TT-S-00203C
5. TT-S-001657, Sealing Compound: Butyl Rubber Base
6. SS-C-153, Mastic Bulk Compound

F. Flat Glass Marketing Association (FGMA)
1. Glazing Sealing Systems Manual
2. Glazing Manual

1.4 SUBMITTALS

A. Shop Drawings: Complete shop drawings by manufacturer indicating elevations, sections, substrates, fasteners, finishes, hardware and installation details.

B. Manufacturer's specifications and other data needed to prove compliance with specified requirements, and manufacturer's installation instructions.

C. Engineer’s calculations of performance requirements.

D. Product data: manufacturer's specifications and test reports from an AAMA-accredited laboratory.

E. Samples: Showing color
1. Samples of each type of glass (12 inches x 12 inches minimum)

2. In place sample of sealant at frame perimeter for Architect's approval. Architect will select colors from manufacturer's full available colors.
3. Samples of framing finish and fastener types for Architect's approval. Architect will select finishes and colors from those available from manufacturer.

F. Certification of Installation:
1. Provide written certification stating that materials provided meet the specified requirements.
2. Include the following specific information indicating their compliance with referenced standards.
a. Thermal movement
b. Structural properties
c. Water penetration
d. Air leakage
e. Finishes on aluminum surfaces

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in the above referenced Flat Glass Marketing Association publications.

C. Furnish a valid AAMA "Notice of Product Certification" indicating that the windows for the project conform to AAMA/NWWDA 101/I.S.2-97.

1.6 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and protect windows and accessories in accordance with AAMA CW-10-97 until project completion

1.8 WARRANTY

A. Warrant the work specified herein for (2) years, against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship, except provide a five (5) year warranty against silver spoilage of mirrors.

B. Defects shall include, but not be limited to, the following:
1. Faulty, improper or inadequate attachment or installation.
2. Chipped edges, broken, or scratched glass and mirrors.
3. Defective finish of molding
4. Distortion or waves

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed whose product meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
   1. Glass:
      a. AGC Flat Glass North America, Kingsport Tenn. (423) 229-7200
      b. Guardian Industries Corp., Corsicana, TX; (800) 527-2511
      c. Oldcastle Glass, Houston, TX; (866) 653-2278
      d. Pilkington, Toledo, OH; (419) 247-4721
      e. PPG Industries, Inc., Pittsburgh, PA; (412) 434-2858
      f. Viracon, Owatonna, MN; (800) 533-2080
   2. Aluminum Framing System, and Doors:
      a. ARCH Aluminum & Glass Co., Inc., “Amarlite” Architectural Products, Tamarac, FL; (800) 432-8132
      b. Columbia Commercial Building Products, Rockwall, TX; (800) 668-1645
      c. EFCO Corp., Monett, MO; (800) 221-4169
      d. Kawneer Co., Inc., Jonesboro, GA; (770) 478-8841 (Basis of Specification)
      e. Oldcastle Building Envelope, Houston, TX; (866) 653-2278
      f. Tajima Corp USA, Los Angeles, CA; (818) 547-4595
      g. Wausau Windows and Wall Systems, Wausau, WI; (877) 678-2983
      h. YKK AP America, Inc., Grand Prairie, TX; (972) 206-2554
   3. Aluminum Window Manufacturers:
      a. EFCO Corp., Monett, MO; (800) 221-4169
      b. Kawneer Co., Inc., Jonesboro, GA; (770) 478-8841
      c. Oldcastle Building Envelope, Houston, TX; (866) 653-2278
      e. Any of the above manufacturers accepted for Aluminum Storefronts who produce aluminum windows as specified.

2.2 PERFORMANCE SPECIFICATIONS

A. Requirements apply simultaneously through the most adverse conditions of each exterior application.
   1. Windloads: Building shall be designed according to the IBC and ASTM E1996, and shall be designed to withstand positive and negative windloads normal to the plane of the wall with 120 mph 3-second gust wind speed with Missile Level C (<30 feet height). Windload: Exposure C, 45 psf based on effective opening area of 10 square feet.
   2. Thermal Movement: Provide for noiseless expansion and contraction of all materials and assemblies due to temperature changes in a range between 10 degrees F and 180 degrees F without detriment to appearance or performance.
   3. Water Infiltration: Drain water entering at joints and condensation occurring within the wall construction to the exterior face of the wall. Allow no uncontrolled water other than condensation on the interior face of the wall.
   4. Air Infiltration: Limit air leakage to maximum 0.06 cfm per square foot of wall projected area. (Storefront at 8 lb./sq.ft.)

B. Aluminum Window Requirements Conformance to specifications in AAMA/NWWDA 101/I.S.2 when tests are performed on the prescribed 8'0" x 5’0” minimum test size with the following test results:
   1. Air Infiltration: maximum .07 cfm/square foot when tested per ASTM E 283 at a static air pressure difference of 1.57 psf.
   2. Water Penetration: no uncontrolled water leakage when tested per ASTM E 547 and ASTM E 331 at a static air pressure difference of 10 psf

3. Uniform Structural: window to be operable, and maximum .4% permanent deformation per member when tested per ASTM E 330 at a static air pressure difference of 67.5 psf.

2.3 MATERIALS

A. Aluminum:
1. Aluminum Alloys: Comply with the standards and designations of the Aluminum Association and the following ASTM Standards:
   a. Sheet and Plate: ASTM B209
   b. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.
   c. Bars, Rods, and Wire: ASTM B211
   d. Standard Structural Shapes: ASTM B308
   e. Drawn Seamless Tube: ASTM B210
   f. Extruded Structural Pipe and Tubes: ASTM B429
   g. Welding Rods and Bare Electrodes: AWS Code
2. Aluminum Finish: Clear Anodized
   a. Quality standard: conforming to AAMA 2604 for applied finishes or AAMA 661 for anodized finishes.
   b. Pretreatment: five-stage; zinc chromate conversion coating.
   c. Application: electrostatic spray and oven bake by approved applicator.
   d. Coating quantity: minimum one primer coat and one color coat.
   e. Dry film thickness: minimum 1.2 mils on exposed surfaces, except inside corners and channels.
3. Color: chosen from manufacturer's standards

B. Steel:
1. Carbon Steel: Refer to the Structural Steel Section. Provide structural reinforcement as required.
2. Stainless Steel Fasteners: ASTM A167, type 302/304 No. 4 satin finish where exposed.
3. Metals used for shims shall be galvanized steel (ASTM A36 or ASTM A283) where noted as steel and stainless steel (300 Series) where noted as stainless steel. Do not use aluminum or plastic shims unless approved by the Architect.
4. Exposed Cladding, Trim and Panels: Provide cladding elements with formed edge flanges and backside stiffener members as required to maintain such flatness that when measured at room temperature the maximum slope of the surface at any point, measured from the nominal plane of the surface in its final installed position shall not exceed 1.25 degrees.
5. Metal Protection: Materials used as permanent or temporary protection for metals shall conform with the following standards:
   a. Bituminous Paint: FS TT-C-494 or MIL-P-6883A.
   b. Mastic Bulk Compound: FS SS-C-153, Type I or Type II.
   c. Preformed Mastic Tape: NAAMM Specifications for Non-Shrinking, Non-Resilient Performed Sealing Compound
   d. Zinc Rich Paint: MIL-P-38 336.

C. Glazing Materials at Hollow Metal Frames:
1. General: Use glazing compounds and preformed glazing sealants approved for the application and, except as otherwise specified, conforming to Glazing Materials portion of FGMA Glazing Manual.
2. Sealant:
   a. One (1) part acrylic polymer sealant conforming to FS TT-S-00230 or silicone, FS TT-S-0023-C. Use for glazing of all fixed glass. Include primer as recommended by manufacturer.

b. Color: To match frame.
c. All sealants shall be compatible with adjacent material per manufacturer's instruction.

3. Setting Blocks: Hard rubber or clean grain softwood.
4. Back-up material: Foamed polyethylene or polystyrene rodstock, sizes as required by joint condition, and compatible with sealant.
5. Glazing Tape: DAP #1202 or as approved.
6. Glazing Gaskets: Extruded neoprene, free of porosity, surface defects, dimensional irregularities and conforming to physical properties of ASTM C509.
7. Use of metal sash putty will not be permitted, but compound conforming to FS T-G-410 will be permitted. The use of nonskinning compounds, nonresilient type preformed sealers, and preformed impregnated type gasket will not be permitted.

D. Glazing Materials at Aluminum Framing:
1. Glazing Gaskets: Extruded neoprene (Color: Black) sized to fit the frame.
2. Sealant: Comply with Federal Spec. TT-S-00230

E. Concealed Reinforcement Materials:
1. Steel:
a. Carbon Steel: Refer to the structural steel section. Provide structural reinforcement as required.
b. Metal Protection: Materials used as permanent or temporary protection for metals shall conform with the following standards:
1) Bituminous Paint: FS TT-C-494 or MIL-P-6883A.
2) Mastic Bulk Compound: FS SS-C-153, Type I or Type II.
3) Preformed Mastic Tape: NAAMM Specifications for Non-Shrinking, Non-Resilient Performed Sealing Compound
4) Zinc Rich Paint: MIL-P-38 336.

F. Glass:
1. General:
a. Glass shall meet the requirements of ASTM C1036.
b. Float Glass: Care shall be taken to minimize the tong marks and, unless indicated otherwise on the drawings, the tong marks shall occur at the bottom of the glass (after installation).
c. All glass shall be heat strengthened unless noted otherwise.
d. Color of tinted glass shall be as selected by Architect.
e. Safety Glazing: Subject to compliance with requirements, obtain safety glazing products permanently marked on each individual glass lite with certification label of manufacturer acceptable to authorities having jurisdiction. Safety glazing shall conform to ANSI Z97.1, Safety Performance Specification, and ANSI Z97.1, Safety Glass Code., and IBC 2406.1 as applicable.
2. Glass Types: (As shown or required)
a. Type G-1: Type: 1 inch thick insulating glass units comprised of a 1/4 inch thick glazing quality Low-e tinted tempered float glass exterior lite with a 1/4 inch thick glazing quality clear tempered float glass interior lite, separated by a 1/2 inch air space. Color shall be 70XL"Solarbronze" manufactured by PPG Industries, or Architect approved equal at all exterior locations typical, except where indicated otherwise and having the following properties:
1) Visible Light Transmittance (%):64
2) Winter Night-time U-value: .28
3) Light to Solar Gain Ratio (LSG): 2.37

b. Type G-2: 1/4 inch thick glazing quality, tinted float glass to match tinted tempered float glass specified as Type G-1 above.
c. Type G-3: 1/4 inch thick glazing quality, clear, tempered float glass.
d. Type G-4: 1/4 inch thick mirrored glass with polished edges.

G. Aluminum and Glass Entrance Doors: Kawneer Co., Inc., “Series 500 Wide Stile” Swing Door Standard Entrance or equivalent product from list of approved manufacturers.
1. Doors: Shall be 1-23/32 inch thick, consisting of 5 inch vertical stile, 5 inch top rail and 10 inch bottom rail aluminum tubular sections with 0.125 inch thick nominal wall thickness to comply with 2012 TAS Section 404.2.10.
2. Connections:
a. Provide bolted and welded connections, fit to a hairline joint.
b. Provide reinforcing at bolted attachments. Tapped aluminum is not permitted.
c. Provide concealed screws, nuts, bolts, and anchors, except hardware screws on butt of door, of non-corrosive metal.
3. Glass in Door: Type G-1 at all exterior locations. Deliver doors to job pre-glazed.
4. Glazing Gaskets: Use manufacturer's recommended gaskets for flush glazing (color: Black).
5. Mullion Stabilizer: Provide as required at double acting doors with removable mullion.
6. Hardware: Refer to Section 08 71 00, Finish Hardware.

H. Aluminum Storefront/Entrance Framing System: Kawneer Co., Inc., "TRIFAB VG 451 (VersaGlaze)”, typically; or equivalent product from list of approved manufacturers:
1. Size 1-3/4 inch by 4-1/2 inch flush glazed type (typical).
2. Provide mullion reinforcement, if necessary, to achieve structural requirements.
3. Glass Pockets: Shall be sized to accept specified glass.
4. Provide sill receptors with end dams. (At all sill conditions.)

K. Mirror Accessories:
1. Mastic: Asphalt mirror setting cement conforming to “Mirro-Mastic” manufactured by Palmer Products Corp. (502) 893-3668 or type approved by mirror manufacturer to suit application.
2. Molding: Continuous aluminum “J” shaped channel as manufactured by J. G. Braun Co. or type approved by mirror manufacturer for top and bottom support. Color shall be as selected by Architect.
3. Fasteners and Anchors: Of type, size, and finish recommended by manufacturer to suit application.
4. Setting Blocks: Hard rubber

PART 3 - EXECUTION

3.1 PREPARATION

A. Obtain hardware templates from finish hardware supplier.

3.2 SURFACE CONDITIONS

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.

1. Remove protective coatings which fail in adhesion or interfere with bond of sealants.
2. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.
3. Prime surfaces to receive glazing compounds in accordance with manufacturer's recommendations.

3.3 INSTALLATION

A. Inspect each piece of glass immediately prior to start of installation.
   1. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or damaged in any other manner.
   2. Do not remove labels from glass until so directed by the Architect.
   3. Install glass so distortion waves, if present, run in the horizontal direction.

B. Locate setting blocks at sills one quarter of the width of the glass in from each end of the glass, unless otherwise recommended by the glass manufacturer.
   1. Use blocks of proper size to support the glass in accordance with the manufacturer's recommendations.
   2. Provide spacers for all glass sizes larger than 50 united inches, to separate glass from stops; except where continuous glazing gaskets or felts are provided.
      a. Locate spacers no more than 24 inches apart, and no closer than 12 inches to a corner.
      b. Place spacers opposite on another.
      c. Make bite of spacer on glass 1/4 inch or more.

C. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.

D. Do not use two (2) different glazing materials in the same joint system unless the joint use is approved in advance by the Architect.

E. Mask, or otherwise protect, surfaces adjacent to installation or sealants.

F. Install all glass, gasket, aluminum framing, and ticket window in accordance with manufacturer's printed instructions. Installed windows units shall conform to AAMA 502 minimum requirements for air and water infiltration.

G. Caulk joints where indicated to meet performance specifications using materials specified in Sealants section. Follow sealant manufacturer’s printed instructions for the installation of his product.

H. Erection Tolerances:
   1. Maximum Deviation from Vertical: 1/8 inch in any story and 1/4 inch in any 45 foot run.
   2. Maximum Deviation from Horizontal: 1/8 inch in any 30 foot run.
   3. Maximum Deviation from True Alignment: 1/32 inch for any two (2) abutting units. Allow no edge projections.
   4. Maximum Joint Gap: 1/32 inch.
   5. Maximum Openings Between Movable Glazing Stop and Adjacent Member: 1/32 inch.

3.4 PROTECTION AND ADJUSTMENTS

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass except as specifically directed by the Architect.

B. Adjust windows as necessary for smooth and weather tight operation and leave windows clean and free of construction debris.

END OF SECTION

SECTION 09 21 16

GYPSUM WALLBOARD SYSTEMS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal wall and ceiling framing for gypsum board construction.

B. Exterior Sheathing.

C. Gypsum Wallboard

D. Cement Tile Backer Board

E. Moisture Resistant Tile Backer Board

F. Taped, filled and sanded joint treatment.

1.2 RELATED WORK

A. Section 05 40 00 - Cold Formed Metal Framing

B. Section 07 11 00 - Dampproofing Above Grade

C. Section 07 21 00 - Building Insulation

D. Section 07 84 00 - Firestopping and Fire Safing

E. Section 07 92 00 - Building Sealants

F. Section 09 30 13 - Ceramic Tile

G. Section 09 91 00 - Painting and Staining

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions.

B. Certification: Manufacturer’s affidavit that materials used contains no asbestos.

1.4 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

1.5 REFERENCES

A. ASTM International (ASTM)
   1. C1396/C1396M, Standard Specification for Gypsum Wallboard

2. C645-08, Standard Specification for Nonstructural Steel Framing Members
3. C754-07, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
4. C840, Standard Specification for Application and Finishing of Gypsum Board
5. C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness
6. C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
7. C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
8. C1177, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
9. C1280, Standard Specification for Application of Gypsum Sheathing
10. D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

B. Gypsum Association (GA)
1. 216, “Recommended Specification for the Application and Finishing of Gypsumboard"

C. Federal Specifications (FS)
1. SS-L-30

1.6 WARRANTY

A. Warrant the work specified for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.

B. In addition, provide warranty from the manufacturer for the following products:
1. Exterior sheathing weathering warranty covering in-place exposure damage to exterior sheathing for twelve (12) months.
2. Exterior sheathing warranty against manufacturing defects for five (5) years.
3. Abuse Resistant Panel weathering warranty covering in-place exposure damage to sheathing for six (6) months.
4. Abuse Resistant Panel warranty against manufacturing defects for three (3) years.
5. Glass-mat sheathing weathering warranty covering in-place exposure damage to sheathing for three (3) months.
6. Glass-mat sheathing warranty against manufacturing defects for three (3) years.
7. Tile backer board warranty against manufacturing defects for 20 years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Where products are named in the specifications, they are considered basis of specification. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered. <u>All gypsum wallboard must be U.S. produced.</u>

1. Gypsum Wallboard and related products and materials:
   a. CertainTeed
   b. G-P Gypsum Corporation (Georgia Pacific)
   c. James Hardie Building Products, Inc.
   d. National Gypsum Company (Gold Bond)
   e. Temple-Inland
   f. United States Gypsum Company (USG)
   g. Dietrich Metal Framing
2. Aluminum Moldings:
   a. Fry Reglet Corporation
   b. MM Systems Corporation
3. Deflection Track and related products and materials:
   a. Fire Trak Corp.
   b. The STEEL Network, Inc.
   c. Dietrich Metal Framing

2.2 MATERIALS

A. Metal Framing System:
1. Studs:
   a. Meeting requirements of ASTM C645-08; C-channel, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating. Channel type screw studs roll formed from 25 gauge galvanized steel, unless otherwise shown on drawings. Provide channel type screw studs roll formed from 20 gauge (l/360) galvanized steel at walls to receive tile.
   b. Widths shall be as indicated on drawings.
   c. Section modules for studs shall be S = 0.135 for 3-5/8 inch studs, and S = 0.082 for 2-1/2 inch studs.
2. Tracks:
   a. Meeting requirements of ASTM C645-08; C-channel, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating
   b. Widths shall be as indicated on drawings.
   c. Deflection Track (DT) (Non-rated walls): Use deflection track at walls extending to structure to allow for movement. Deflection track shall allow 1/2 inch movement. Do not fasten studs directly to Deflection Track.
   d. Deflection Track and Firestop System (At fire rated walls): Contractor shall use a deflection track and firestop system at heads of fire rated partitions. System shall use “Shadowline” deflection track, mineral fiber, sealant, clips, and accessories required to achieve fire ratings shown or required by authorities having jurisdiction. System shall comply with Deflection Track and Firestop System manufactured by Fire Trak Corp., Kimball, MN; (800) 394-9875, Dietrich Metal Framing; SLP-TRK® Slotted Deflection Track by Brady Innovations or equal or comparable products manufactured by The STEEL Network, Inc., Raleigh, NC; (919) 845-1025, or Architect approved equal.
   e. Channel Bridging and Bracing: U-Channel Assembly; Base metal thickness of .0538 inch (1.37mm) and minimum ½ inch wide flanges.
   f. FLAT STRAP AND BACKING PLATE: Sheet for blocking and bracing in length and width indicated:
      1) Subject to compliance with requirements, provide Dietrich Metal Framing: Danback™ Fire Treated Wood Backing Plate
      2) Galvanized Sheet Steel.

3. Comply with applicable reference standards.
4. Refer to Section 05 40 00 for light gauge steel framing for 18 gauge and heavier runners and other framing as shown or required.

B. Drywall Suspension System (If shown or required): Pre-engineered drywall suspension system specially created to simplify the design and construction of flat drywall ceilings. Approved Product/Manufacturer: USG Drywall Suspension System manufactured by USG Interiors, Inc., or Architect approved equal.

C. Wall and Ceiling Materials:
1. Exterior Sheathing: ASTM C1177; 1/2 inch thick water resistant treated gypsum core, glass mats both front and back faced or embedded in core, weather resistant surface, zero flame spread, zero smoke developed. Approved Product/Manufacturer: "Dens-Glass Exterior Sheathing" manufactured by Georgia-Pacific; "GlasRoc" manufactured by CertainTeed; "Securock" manufactured by USG; "Gold Bond e^{2}XP" manufactured by National Gypsum. Use as exterior sheathing in metal stud framed construction behind face brick in cavity wall construction, and behind plaster.
2. Gypsum Wallboard:
   a. Wallboard: 5/8 inch thick, tapered-edged, conforming to ASTM C1396, Type X. Sizes shall be 4 feet-0 inches wide by longest practical length to minimize joints.
   b. Moisture Resistant: 5/8 inch thick, moisture resistant (MR), green faced, tapered-edged, conforming to ASTM C1396. Sizes shall be 4 feet-0 inches wide by longest practical length to minimize joints. Provide fire rated core where required to maintain fire rating of adjacent assembly.
3. Cement Tile Backer Board (Wet areas): 1/2 inch thick, "G-P Dens-Shield Tile Guard", Bonsal "Util-A-Crete", "USG Durock", Custom Building Products "Wonderboard", "National Gypsum Permabase", or Architect approved equal. Use as sheathing at shower areas and restrooms, or as scheduled on walls to receive ceramic tile in other wet areas. Use greatest width by longest practical length to minimize joints. Use joint reinforcement and fasteners in accordance with manufacturer's printed instructions. For fiber and cement backer boards, provide waterproof membrane behind backer board per TCA W244. Coated glass-mat water-resistant gypsum board does not require waterproofing membrane per TCA W245.
7. Moisture Resistant Tile Backer Board (Dry areas): 1/2 inch thick, "Fiberock Brand 'Aqua-Tough' Gypsum Interior Panels" as manufactured by USG Corporation; "DensArmor Interior Guard Plus" manufactured by G-P Gypsum Corp, or Architect approved equal.
8. Channels: 16 gauge cold formed steel channels with hot dip galvanized finish. Sizes as indicated on drawings. Use for suspended ceilings and elsewhere as indicated.
9. Furring Channels: Standard 2-3/4 inches wide, 7/8 inch deep galvanized sheet metal furring channel.
10. Corner Beads: No. 28 gauge galvanized steel, 1-1/4 inch legs. Use at all exterior corners.
11. Joint Compound: Standard types manufactured by gypsum wallboard manufacturer for intended use. Fire rated type must be used on fireproof systems. Perlite and other additives not permitted.
12. Laminating Adhesives: Standard type manufactured or recommended by manufacturer of product to be laminated.
13. Acoustic Sealant: Single component, non-skinning, non-hardening synthetic rubber for use in the acoustical sealing of gypsum board partitions. STC rating as

required by drawings in accordance with manufacturers instructions to achieve rating. Approved Products and Manufacturers: Tremco Acoustical Sealant manufactured by Tremco Sealant/Weatherproofing Division, Beachwood, OH; (800) 321-7906, or Architect approved equal.

14. Ceiling Hanger and Tie Wire: 9-gauge galvanized hanger wire and 16 gauge tie wire.
15. Screws: One (1) inch and 1-5/8 inch long self drilling, self tapping cadmium plated bugle head type. Comply with applicable reference standards.
16. Resilient Clips: Standard type for resilient installation in accordance with wallboard manufacturer's recommendations.
17. Control Joints: Metal (USG #093 / Dietrich 093 Control Joint) type with 1/4 inch open joint, perforated flanges for floating in place.
18. Wall Fixture Reinforcement: 6 inches, 14 gauge cold formed steel galvanized channels.
19. Glass-fiber Mesh Tape: minimum 2 inch wide self-adhering glass-fiber type, 10X10 threads per inch.
20. Silicone Joint Sealant: ASTM C920, Type S, grade NS, compatible with exterior sheathing tape and sheathing, instructed by tape and sheathing manufacturers for use with glass-fiber mesh sheathing tape and for covering exposed fasteners.
21. Waterproof membrane under cementitious/fiber tile backer board shall be minimum 15-pound building felt or 4-mil polyethylene film in accordance with ANSI A2.1.8.

PART 3 - EXECUTION

3.1 EXTERIOR SHEATHING INSTALLATION

A. Furnish exterior sheathing where indicated on drawings and install sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253 and ASTM C1280, without openings, gaps, cracks, or holes.

B. Attach sheathing to metal framing with gold side out and with screws spaced eight (8) inches on center at perimeter where there are framing supports and eight (8) inches on center along intermediate framing in field.

C. Use maximum lengths possible to minimize number of joints.

D. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.

E. Locate fasteners minimum 3/8 inch from edges and ends of sheathing panels.

F. Apply continuous dampproofing as specified in Section 07 11 00, Dampproofing Above Grade. Prep exterior sheathing per manufacturer's instructions.

3.2 INTERIOR METAL FRAMING INSTALLATION

A. Steel Framing Installation Standard: Comply with ASTM C754.

B. Floor Track: Attach to floor at 24 inches maximum centers with shoot-in pins or concrete nails.

C. Ceiling Track: Fasten at 24 inch intervals, staggered. Where shown or required to extend above ceiling, brace to the structure at intervals not exceeding 4 feet-0 inches.

D. Deflection Track (DT): Deflection track shall allow 1/2 inch movement. Do not fasten studs directly to Deflection Track. At fire rated walls, Contractor's shall use the specified deflection track with firestop systems.

E. Drywall Suspension System: Use at gypsum drywall suspended ceilings, where shown or required.

F. Metal Studs:
1. Single lengths positioned vertically straight and plumb in the runners, spaced 16 inches on center, unless shown otherwise on drawings.
2. Anchor all studs located adjacent to door and window frames, partitions intersections and corners to runner flanges by positive screw engagement through each stud flange and runner flange.
3. Position all studs vertically with the open side facing in the same direction, engaging the floor and ceiling runners.
4. Use positive screw attachments with 3/8 inch or 1/2 inch Type "S" or "S-12" pan head screws through each stud flange and runner flange.

G. Wall Fixture Reinforcement: Provide solid bridging spanning between wall studs at all wall mounted fixtures, finish hardware, toilet partitions, accessories and equipment.

3.3 GYPSUM WALLBOARD INSTALLATION

A. Apply all ceiling boards first as described below. Cut boards so that they slip easily into place. Butt all joints loosely. Never force panels into position. Place tapered or wrapped edges next to one another.

B. Select the maximum practical length to minimize end joints. All end joints shall be neatly fitted and staggered. Joints on opposite sides of partition shall be so arranged as to occur on different studs.

C. Never place a butt end or a cut edge next to a tapered or rounded edge. Wherever possible, apply boards perpendicular to framing and in lengths that will span ceilings and walls without creating end (butt) joints. If butt joints do occur, stagger and locate them as far from the center of walls and ceilings as possible.

D. Support all ends and edges of gypsum board on framing, except long edges at right angles to framing and where end joints are to be floated between frame members and back-blocked.

E. When fastening, apply hand pressure on panel next to fastener being driven to insure panel is in tight contact with framing member.

F. Install metal corner bead at external corners. Where length of the corner does not exceed standard stock lengths, use a single length.

G. Install gypsum board 1/2 inch above surface of slab to prevent wicking of moisture.

H. Install metal trim where indicated.

I. To insure level surfaces at joints, arrange board application so that the leading edge of each board is attached to the open or unsupported edge of a steel stud flange. To do this, all studs must be placed so that their flanges point in the same direction. Board application is then planned to advance in the direction opposite to flange direction.

J. The leading edge of gypsum board shall not be attached to the web edge of a flange.

K. Fasten wallboard at 12 inches on center except at the edges/joints which shall be at 8 inches on center

L. Edge-Grip Clips: Position clips on the back of the panels and drive prongs into panel edges. Space clips 16 inches on center Screw-attach clip to framing, furring or wall surface.

M. Finishing:
1. Apply at least two (2) coats of joint compound over beads, screw heads and trim, and each coat shall be feathered out onto panel faces.
2. Float out and sand joints to make joints invisible when painted with non-texture paint.

N. Caulk around pipes, ducts, structure or similar items which penetrate drywall systems.

O. Provide acoustical sealant at walls in accordance with manufacturer's instructions.

P. Control joints shall be located 30 feet-0 inches on center maximum and along building expansion joints, unless noted otherwise on drawings. Locations shall be reviewed with Architect prior to final placement.

3.4 CEMENT TILE BACKER BOARD INSTALLATION – WET AREAS

A. Install tile backer on walls vertically or horizontally.

B. Coated Glass Mat Backer Boards: Install tile backer directly on metal stud framing system in showers and other wet areas in accordance with manufacturer's recommendations and TCA, Methods W245 at walls and B420 for shower installations.

C. Cementitious/Fiber Backer Boards: Install tile backer on approved waterproof membrane in showers and other wet areas in accordance with manufacturer's recommendations and TCA, Methods W244 at walls and B419 for shower installations.

D. Finishing:
1. Substrate for tile: Apply clear silicone sealant to corners and board joints. Apply glass mesh joint tape over joints. Embed tape in setting material specified for tile finishes. Seal penetrations with setting material or silicone sealant. Allow joints and penetrations to dry prior to installing tile systems.

3.5 MOISTURE RESISTANT TILE BACKER BOARD INSTALLATION – DRY AREAS

A. Install tile backer on walls vertically or horizontally.

B. Install tile backer on walls in accordance with manufacturer's recommendations and TCA, Method W245.

C. Finishing:
1. Substrate for tile: Apply glass mesh joint tape over joints. Embed tape in setting material specified for tile finishes. Allow joints to dry prior to installing tile systems.

3.7 CEILING FRAMING INSTALLATION

A. Main Runners: 9-gauge hanger wires shall be spaced not over 4 feet-0 inches in the direction of 1-1/2 inch main runner channels and not over 4 feet-0 inches in the direction of right angles to the main runners, and within 6 inches of the ends of main runners and of boundary walls, girders or similar interruptions of ceiling continuity. Do not hang wire supports from metal deck unless directed to do so by Architect or Structural Engineer. Main runners shall be spaced not over 4 feet-0 inches on center.

B. Cross tees shall be spaced in accordance with manufacturer's recommendations or in conformance with UL Fire Resistance Directory.

C. Furring Channels: Space 16 inches on center, and saddle-tie with two strands of 16-gauge tie wire to main runners or main support members. Do not let into or come in contact with abutting masonry walls. End splices shall be provided by nesting channels or studs no less than 8 inches and securely wire-tie.

D. Drywall Suspension System: Install where indicated in accordance with manufacturer's instructions.

E. Provide control joints in ceiling at maximum 30 feet on center and, if possible, to coincide with expansion joints in the roof above.

3.8 CEILING BOARD INSTALLATION

A. Apply gypsum board of maximum practical length with the long dimension at right angles to the furring channel and fastened with one (1) inch drywall screws spaced 12 inches on center in the field of the board and along abutting ends.

B. Align abutting end or edge joints over the web surface of the furring channel. Tie neatly and accurately with end joints staggered.

C. Install gypsum board ceiling panels in drywall suspension system.

3.9 WORKMANSHIP TOLERANCES

A. Visual: Correct any nicks, bumps, out-of-level or out - of-plumb areas detectable to the naked eye.

B. Walls: 3/8 inch maximum deviation from vertical.
C. Bumps in Boards: Maximum 1/8 inch in 24 inches.

D. Corners: Maximum out-of-square 1/8 inch in 16 inches.

E. Float solid between corner beads less than 36 inches apart. Surfaces that appear concave are not acceptable.

F. Provide "J" mold and continuous 1/4 inch reveal wherever gypsum board directly abutts other material or when end is exposed.

G. Float Control Joints flush with wall surface so that ceiling wall mold specified separately will align with wall surface flat and straight.

3.11 COMMENCEMENT RESTRICTIONS

A. Interior gypsum wallboard and ceiling board installation may not commence until all exterior dampproofing and roofing are completed and roof top equipment is fully installed and flashed and exterior wall openings are protected.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL LAY-IN CEILING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Suspension system (Grid) and accessories required to complete work.

B. Acoustical lay-in panels: standard, fire rated, and sag resistant.

C. Vinyl faced, sag resistant, scrubbable lay-in panels.

D. Hold down clips, spacing clips, moldings, and accessories required to complete work.

1.2 RELATED WORK

A. Section 09 21 16 - Gypsum Wallboard Systems: Wallboard used as fire protection over light fixtures.

B. Division 15 - Mechanical: Air diffusers and mechanical items penetrating ceiling.

C. Division 16 - Electrical: Lighting and electrical items penetrating ceiling.

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer's installation instructions.

B. Samples:
1. 6 inch by 12 inch sample of each ceiling panel.
2. 12 inch long sample of each type grid and actual accessories.

1.4 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

1.5 REFERENCES

A. ASTM International (ASTM)
1. A641, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
2. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus
3. C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
4. C635, Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
5. C636, Standard Practice for Installation of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

6. D3273, Standard Test Method for Resistance to growth of Mold on the surface of Interior ceilings in an Environmental Chamber
7. E84, Test Method for Surface Burning Characteristics of Building Materials
8. E413, Classification for Rating Sound Insulation
9. E1264, Standard Classification for Acoustical Ceiling Products

B. Federal Specification (FS)
1. SS-S-118B, Sound Controlling (Acoustical) Tiles and Panels

C. Underwriters Laboratories (UL)
1. Assembly as specified or noted on drawings

1.6 COORDINATION

A. Coordinate Work of this Section with work under Division 15, Mechanical for location of dampers in diffusers and other mechanical items penetrating ceiling and Division 16, Electrical for location of light fixtures and other electrical items penetrating ceiling.

1.7 WARRANTY

A. Standard ceiling Panels: warrant ceiling panels to be free from sagging, warping, shrinking, buckling, or delaminating as a result of manufacturing defects for a period of one (1) year from the date of Substantial Completion.

B. Sag Resistant ceiling Panels: warrant products to be free from sagging, warping, shrinking, buckling, or delaminating as a result of manufacturing defects for a period of ten (10) years from the date of Substantial Completion.

C. Standard Suspension System: Suspension systems shall be warranted to be free from defects in material or factory workmanship and shall not incur 50 percent red rust as defined by ASTM B117 test procedures for a period of ten (10) years from the date of Substantial Completion.

D. Suspension System / Ceiling Panels: Provide manufacturers standard 15 year warranty for suspension systems when used in combination with same manufacturers sag resistant ceiling panels. Ceiling panels to be free from sagging, warping, shrinking, buckling, or delaminating as a result of manufacturing defects. Suspension systems shall not incur 50 percent red rust as defined by ASTM B117 test during the period of the warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Specifications are based on products of named manufacturers. Manufacturers listed whose product meets or exceeds the specifications may be used on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
1. Suspension System (Grid):
a. Armstrong World Industries, Inc. (Basis of Specification)
b. Certainteed (BPB Celotex)
c. Chicago Metallic

d. USG Interiors, Inc.(Donn)

2. Acoustical Lay-in Panels:
   a. Armstrong World Industries, Inc. (Basis of Specification)
   b. Certainteed (BPB Celotex / Capaul)
   c. Conwed Designscapes
   d. USG Interiors, Inc.

2.2 MATERIALS

A. Suspension System (Grid):
   1. Type: ASTM C635, intermediate duty; exposed T; components die cut and interlocking.
   2. Materials: Commercial quality cold rolled steel with galvanized coating.
   3. Exposed Grid Surface Width: 15/16 inch.
   4. Grid Finish: White.
   5. Accessories:
      a. Perimeter moldings.
      b. Hold down clips.
      c. Aluminum cap for use over steel grid in kitchen areas or where shown on drawings or required. White color.
   6. Approved Product/Manufacturer:
      a. Fire Rated: “Prelude XL Fire Guard 15/16 inch as manufactured by Armstrong World Industries, Inc. or Architect approved equal by acceptable manufacturers.
      b. Non-Rated: “Prelude XL 15/16 inch as manufactured by Armstrong World Industries, Inc. or Architect approved equal by acceptable manufacturers
   7. Hanger Wire:
      a. Galvanized carbon steel in accordance with ASTM A641, soft temper, prestretched, with a yield stress load of at least three (3) times the design load, but not less than 12 gauge in diameter.

B. Lay-in Panels:

   1. Type “A”: Standard
      a. Material: Wet-formed mineral fiber.
      b. Size: 24 inches by 24 inches by 5/8 inch thick.
      c. Edge Detail: Square lay-in, trim edge
      d. NRC: 0.55 - 0.65 in accordance with ASTM E1264.
      e. CAC: 30 - 35 in accordance with ASTM E1264.
      f. Surface Finish: Factory applied white latex typical.
      g. Flame Spread: Class A
      h. Fire Rating: Where indicated, provide UL Labeled for use in fire resistive assemblies in hourly rating required.
      i. Pattern: Perforated medium texture, non-directional.
      j. Accessories: Hold down clips as required for U.L. assembly.
      k. Specified Product/Manufacturer: “Cortega Square Lay-In Panels” No. 770 or fire-rated No. 824 FireGuard as manufactured by Armstrong World Industries, Inc.; or Architect approved equal by listed manufacturer.

   2. Type “B”: Sag Resistant, Anti-microbial
      a. Material: Wet-formed mineral fiber.

b. Size: 24 inches by 24 inches by 5/8 inch thick.
c. Edge Detail: Square lay-in, trim edge
d. NRC: 0.55 - 0.65 in accordance with ASTM E1264.
e. CAC: 30 - 35 in accordance with ASTM E1264.
f. Surface Finish: Factory applied latex typical. Architect to select color.
g. Flame Spread: Class A
h. Fire Rating: Where indicated, provide UL Labeled for use in fire resistive assemblies in hourly rating required.
i. Pattern: Perforated medium texture, non-directional.
j. Mold / Mildew inhibitor: Manufactures anti-microbial treatment in accordance with ASTM D3273.
k. Accessories: Hold down clips as required for U.L. assembly.
l. Specified Product/Manufacturer: “Fine Fissured Square Lay-In Panels” No. 1728 or fire-rated No. 1831 FireGuard as manufactured by Armstrong World Industries, Inc.; or Architect approved equal by listed manufacturer.

C. Accessories:
1. Shadow Molding: At all locations (whether detailed or not) where an acoustical lay-in ceiling abuts a gypsum board ceiling in the same plane, provide a "W" shaped reveal or "shadow" molding similar to USG No. MS 174.
2. Fixture Protection (option in lieu of gypsum board assembly):
a. Manufacturer/Type: “Thermafiber” Light Protection Kit as manufactured by USG; or Armstrong Type 5/8 or 3/4 P(S) as manufactured by Armstrong World Industries; or equivalent.
b. Fire Resistance Rating: to provide required ceiling assembly rating as scheduled.
c. Locations: at fixtures being reinstalled in new fire rated ceiling assemblies.

2.3 EXTRA STOCK

A. At completion of work, deliver and store at site as directed not less than three (3) unopened cartons of Type “A” and “B’ acoustical ceiling materials and as directed not less than one (1) unopened carton of Type “C” acoustical ceiling material. One (1) unopened box of suspension system material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Insure that walls are flat and wall corners square. Commencing work shall be construed as acceptance of preceding work performed by others as suitable to receive Work of this Section.

B. Insure that wall control joints are flat and will not cause wall mould to misalign at those locations.

C. Coordinate all locations of cut panels with Architect in field prior to commencing work.

D. Do not install any ceiling panel until all above plumbing work, ceiling inspections and corrections have been completed.

3.2 SUSPENDED CEILING SYSTEMS

A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
   1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C636.

B. Install ceiling systems by skilled workmen in accordance with manufacturer's printed instructions, the approved shop drawings and reflected ceiling plans. Exposed surfaces of acoustical units shall be level and flush, with all joints straight and true. Cutting and fitting around all items protruding through acoustical ceiling shall be done neatly. Edge moldings and runners shall have flush hairline joints, with all corners mitered. Pop rivets for joining members are not permitted.

C. Typically, unless indicated on the drawings, install system so that panels are centered in the space in both directions to limit small cut pieces to minimum of three (3) inches on any side, or so that light fixtures are centered above work areas. If conflicts arise, notify architect immediately for determination and proper locations.

D. Install main beam and cross tees in accordance with reflected ceiling plans. Suspend main beams from structure (but not bridging) above by means of 12 gauge galvanized wire, spaced at 4 feet-0 inches on center, both directions, wrapped tightly at least three (3) full turns. Do not hang wire supports from metal deck unless directed to do so by Architect and/or Structural Engineer. Powder actuated devices in metal deck are not permitted. Join cross tees to main beam with a positive interlock. Pop rivets will not be permitted for field splices.

E. Align beams or tees with angle molding at corners unless authorized by Architect.

F. At perimeter areas, secure angle molding to vertical surfaces, ends of tees to rest on bottom flange of molding. Attachment of cross tees to wall angles with pop rivets will not be permitted. Hanger wire at 45 degree approximately ten (10) inches long may be used to tie the grid to the wall above the ceiling to prevent eventual disengagement of the two (2) components.

G. Install lay-in panels with accessories and hold down clips as shown or required.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING AND BASE

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Resilient (vinyl composition (VCT) tile flooring adhesive attached with accessories in locations shown on drawings.

B. Resilient base adhesive attached in locations shown on drawings.

1.2 REFERENCES

A. ASTM International (ASTM)
   1. F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
   2. F1066, Vinyl Composition Floor Tile
   3. F1861, Standard Specification for Resilient Wall Base
   4. F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions.

B. Samples:
   1. Actual samples or color charts showing manufacturer's full range of colors for Architect's selection.
   2. 12 inch by 12 inch tile in each color selected and 12 inch long piece of base material in each color selected for approval.

C. Certification: Manufacturer's affidavits that materials used in the Project contain no asbestos.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers named first are basis of Specification. Manufacturers listed, whose product meets or exceeds the specifications are approved for use on the Project with Architect's approval. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

2.2 MATERIALS - ALL MATERIALS MUST BE ASBESTOS FREE

A. Vinyl Composition Tile (VCT):
   1. Quality Standard: ASTM F1066.
   2. Size: 12 inches by 12 inches by 1/8 inch thick.
   3. Patterns and Colors: As shown on drawings.
   4. Approved Products/Manufacturers: Imperial Texture Standard Excelon by Armstrong World Industries, Inc., Azrock by Domco Tarkett, Inc. or Architect approved equal by American Biltrite ("Colors Plus™"), Flexco, Mannington Commercial, Roppe Corp., Tarkett by Domco Tarkett, Inc., or Architect approved equal.

B. Rubber Base:
   1. Quality Standard: ASTM F1861.
   2. Material: Rubber, vulcanized, Type TS, Group I, Styles A and B. Vinyl base and Type TP are not acceptable.
   3. Type: Topset cove; 48 inch lengths. No rolls permitted.
   4. Thickness: Full 0.125 (1/8) inch.
   5. Color: As selected by Architect.
   6. Height: Four (4) inches, unless indicated otherwise.
   7. Approved Products/Manufacturers: Burke Flooring, Flexco, Nora Rubber Products, Roppe Corp., or Architect approved equal.

C. Cement-based Floor Leveling Material: ARDEX K-15 Self-Leveling Underlayment Concrete manufactured by Ardex Engineered Cements, Aliquippa, PA; (724) 203-5000; or CX Self-Leveling Underlayment manufactured by BASF Chemrex Inc.; or equal. Gypsum-based products are prohibited.

D. Joining and Edge Finish Moldings:
   1. Usage: For use at flooring terminations with other flooring.
      a. Type: Tapered or bullnose edge, as required to provide juncture at edge of adjacent floor surfaces.
      b. Size: One (1) inch wide by 1/8 inch thick or as applicable to the type of flooring and condition.
      c. Material: Rubber or vinyl as recommended by flooring manufacturer to suit application.
      d. Color(s): As selected by Architect from manufacturer's available colors.
      e. Approved Manufacturers: Burke Flooring, Flexco, Johnsonite, Domco Tarkett, or Architect approved equal.

F. Adhesive:
   1. Tile: Clear set type adhesive; same brand as tile or as instructed and approved by tile manufacturer to suit application.
   2. Base: Rubber-based type; same brand as base or as recommended and approved by base manufacturer to suit application.

G. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation.

2.3 EXTRA STOCK

A. Deliver to the Owner:
   1. Four (4) percent or one (1) unopened carton of each color and pattern of tile selected, whichever is greater.
   2. Four (4) percent or one (1) unopened carton of each color, type, and size base selected, whichever is greater.

3. One (1) gallon container of each type adhesive used for flooring and base.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prepare concrete floors to receive flooring in accordance with ASTM F710.

B. Verify substrates are smooth, level, at required finish elevation, and without more than 1/8 inch in 10 feet-0 inch variation from level or slopes shown on the drawings.

C. Level substrates by grinding high spots or filling low spots with latex cementitious subfloor filler as required.

D. Broom clean or vacuum the surfaces to be covered, and inspect the substrates.

E. Verify substrates are smooth, level, at required finish elevation, and are ready to receive resilient tile flooring and base.

F. Bring discrepancies to the attention of the Architect and do not proceed until such discrepancies are corrected.

G. Conduct moisture test in accordance with ASTM F1869 - maximum allowable amount of moisture emission from floor is 3.0 pounds per 1,000 square feet in 24 hour period, and shall not exceed maximum allowable moisture content as allowed by flooring manufacturer.

H. Starting Work indicates acceptance of existing conditions.

3.3 INSTALLATION

A. General:
1. Install materials only after finishing operations, including painting, have been completed and after permanent heating and cooling system is operating.
2. Verify that moisture content of concrete slabs, building air temperature, and relative humidity are within the limits recommended by the manufacturers of the materials used.

B. Installing Resilient Tiles:
1. Place units with adhesive cement in compliance with the manufacturer's recommendations.
   a. Butt units tightly to vertical surfaces, nosings, edgings, and thresholds.
   b. Scribe as necessary around obstructions and to produce neat joints.
   c. Place tiles tightly laid, even, and in straight parallel lines.
   d. Extend units into toe spaces, door reveals, and in closets and similar spaces.
2. Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite edges of the room are of equal width.

a. Adjust as necessary to avoid use of cut widths less than 3 inches wide at edge of space.
b. Lay units square to axes of the room or space.

3. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.
4. Lay in alternating pattern with grain in all units running 90 degrees from adjacent unit.
5. Place joining and edge finish moldings, including reducer strips tightly butted to units and secured with adhesive, providing at all unprotected edges unless otherwise shown.

C. Installing Base:
1. Install base where shown on the Drawings in accordance with manufacturer's instructions.
2. Use factory-preformed exterior corners, and factory preformed or job-mitered interior corners.

3.4 CLEANING AND PROTECTING

A. Remove excess adhesive and other blemishes from exposed surfaces, using neutral cleaner recommended by the manufacturer of the resilient materials.

END OF SECTION

SECTION 09 91 00

PAINTING AND STAINING

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and field application of paints and stains on interior substrates where shown or required.

B. Surface preparation and field application of paints and stains on exterior substrates where shown or required.

C. Surfaces not included, as applicable to the project, include, but are not limited to the following:
1. Areas above finished ceiling or scheduled "unpainted" on the Finish Schedule of the drawings, except for those items within those spaces scheduled to painted.
2. Exposed concrete, unless noted otherwise.
3. Shop coat of paint on metal, except for damaged shop primer touch-up (unless noted otherwise.
4. Structural steel and related items scheduled to receive sprayed fireproofing or encased in concrete.
5. Face brick, unless otherwise noted.
6. Natural stone.
7. Aluminum and copper items, unless noted otherwise.
8. Factory finished items other than prime painted to be field paint finished.
9. Glass and glass masonry.
10. Sealants of types which should not be painted and to which paint will not adhere.
11. Plastic laminate items, such as doors, countertops, casework, etc.
12. Acoustical ceiling and grid work, unless noted otherwise.
13. Acoustical panels
14. Piping of copper, aluminum, and stainless steel.
15. Stainless steel items.
16. Ceramic or tile of any kind.
17. Valves and controls.
18. Sprinkler heads.
19. Name plates on equipment.
20. Fire rating labels, including those on fire rated doors and frames.
21. Finish hardware, except that which is factory primed and designated as "BHMA 600", if any, in Finish Hardware Section.
22. Existing construction, unless noted otherwise.
23. Materials not noted to be refinished or to receive a finish, except as noted, including, but not limited to the following:
    a. Roofing
    b. Asphalt paving, except for parking and lane striping, fire lane, and "wheel chair" handicapped access parking spaces.
    c. Concrete paving and curbs, except for parking and lane striping, fire lane, and "wheel chair" accessible parking spaces.
    d. Flooring, except those to receive game striping, or as noted.
24. Color coding of Mechanical Room pipes whether insulated or not: (Unless noted or directed otherwise)

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. D16, Standard Terminology for Paint, Related Coatings, Materials and Applications.

1.3 DEFINITIONS

A. Conform to definitions of terms in ASTM D16 in interpreting requirements of this Section.

1.4 SUBMITTALS

A. Material lists. Give the supplier's name, product name, number and generic description of each proposed product and its use. Provide product data sheets if so requested.

B. Samples. Submit full range of colors, patterns, textures and finishes available for selection, including the following:
   1. Color Chips: Provide complete duplicate sets of color chips for color selection.
   2. Small Applied Samples: Provide pieces of actual material on which paint will occur with minimum dry mil thickness of specified paint. Provide painted 12 inch x 12 inch actual gypsum wallboard samples with approved textures for Architect's approval. Approved samples will become standard for which all work will be judged.
   3. Sheen Samples: Provide full range of varying sheens when sheens are controllable by intermixing.

C. Installed Samples. Provide large size samples for approval. Approved samples may be left in place as part of the work.

D. One room and/or area, as selected by the Architect, shall be painted with materials specified or accepted and applied directly from container, unthinned. After acceptance by Architect, room and/or area shall be standard of quality of entire project.

E. Certification. Furnish a letter certifying that materials submitted are truly equivalent or better than those called out in the finish schedule.

1.5 RESPONSIBILITY OF COORDINATION

A. Coordinate the work specified herein with the following work:
   1. Provide information to preceding trades for proper preparation of substrate.
   2. Inspect substrate before proceeding to verify proper preparation.
   3. Notify Architect of any item to receive paint which may not be covered by a scheduled finish type. Architect will furnish appropriate specification.

1.6 QUALITY ASSURANCE

A. Materials:
   1. Delivery and Storage: Products shall be delivered to jobsite in unopened containers bearing manufacturer's labels intact and legible at time of use. Storage shall be in designated areas away from excessive heat and open flames and in accordance with manufacturer's recommendations.
   2. Quality or Grade:
      a. Paints and coatings shall be the manufacturer's highest professional quality material of types specified and shall be applied directly from containers in which material is purchased, except where thinning is recommended by manufacturer and approved by Architect to suit intended use, i.e. painting acoustical tile or panels without destroying their acoustical properties.

b. Primers and other undercoat paints shall be those produced by same manufacturer as finish coats.
c. Thinners shall be those recommended by paint manufacturer's printed instructions.
d. In

3. Equipment:
   a. Spray Equipment: Shall be the type recommended for the application and shall be maintained clean and in proper working order.
   b. Brushes, Rollers, etc.:
      1) Shall be new of the various sizes and types recommended for each application.
      2) Shall be properly cleaned and stored in accordance with manufacturer's instructions at the end of each days' use.
      3) Shall be replaced as often as necessary to attain the best finish quality in the Work.
4. Application:
   a. Applicator:
      1) Shall be person(s) or entity specializing in application of paints and coatings of types specified with minimum five (5) years experience.
      2) Shall provide Owner and Architect a notarized certification that paint used is as specified.
   b. Application:
      1) Shall not proceed on surfaces which are not suitable to be painted, until such surfaces have been corrected. Notify Architect in writing of which surfaces need to be corrected and their locations. Surfaces shall be corrected by the responsible trades. Surfaces not suitable for painting shall include, but not be limited to:
         a) Damaged surfaces.
         b) Oily, greasy, dusty or excessively soiled surfaces.
         c) Non-dressed welds which will be exposed to view.
         d) Lack of touch-up where specified.
         e) Rusted or excessively deteriorated shop-prime painted surfaces.
      2) Number of coats of each of several finishes shall be in accordance with detailed specifications, which will produce first quality finish if properly applied. If number of coats specified fails to produce a finish acceptable to Architect, this Contractor shall apply additional coat or coats at his own expense until acceptable finish is achieved

1.7 PRODUCT HANDLING

A. Store only approved materials at the jobsite, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.

B. Temperature in the storage area shall be between 40 degrees F and 110 degrees F. Open and mix all materials in the storage area.

C. Use all means necessary to protect materials before, during, and after application and to protect the installed work and materials of all other trades.

D. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

E. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 F (35 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

F. Do not paint in snow, rain, fog or mist, or when relative humidity exceeds 85 percent, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

1.8 EXTRA STOCK

A. Upon completion of the work of this section, deliver to the Owner, an extra stock equaling ten (10) percent or a minimum of one (1) gallon, whichever is greater, of each color, type, and gloss of paint used in the work, tightly sealing each container and clearly labeling contents and location where used.

1.9 WARRANTY

A. The undertaking of a painting subcontract will indicate that the subcontractor will warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include by not be limited to the following:
1. Discoloring noticeably by yellowing, streaking, blooming, changing color or darkening
2. Mildewing
3. Peeling, cracking, blistering, alligatoring or releasing from the substrate
4. Chalking or dusting excessively
5. Changing sheen in irregular fashion
6. Softening or becoming tacky
7. Bubbling

C. In the event of damage, immediately make all repairs and replacements necessary for approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All paint materials selected for coating systems for each type of surface shall be the product of a single manufacturer and shall, as a system, have flame spread, fuel contribution, and smoke density test results less than 25.

B. Paint materials listed herein, unless otherwise designated in the "Painting Schedule", are the products of The Sherwin-Williams Company, 101 Prospect Avenue N.W., Cleveland, OH 44115, (800) 321-8194 and require no further approval as to manufacturer or catalogue number.

C. Similar firstline material of the following manufacturers may be used subject to approval by the Architect for items indicated to be coated:
1. Paints:
   a. Benjamin Moore & Co.
   b. Devoe Paint Company
   c. Fuller O'Brien Paints
   d. Martin-Senour Paints (Div. of Sherwin Williams)
   e. Monarch Paint Company
   f. ICI Dulux Paints
   g. Pittsburgh Paints, PPG Industries, Inc., Professional & High Performance Coatings

h. Porter Paints
i. Pratt & Lambert Paints (Div. of Sherwin Williams)
j. Kelly-Moore Paint Co.
k. Kwal Paint
l. Tnemec Company Inc.

2. Stains:
a. Olympic Stains, PPG Industries, Inc., Professional & High Performance Coatings
b. Samuel Cabot, Inc.
c. The Sherwin-Williams Co.

2.2 MATERIALS

A. Paint and Coatings: Ready mixed, except for field catalyzed coatings; having good flow and brushing properties and consistent drying or curing behavior, free of sags and streaks.

B. Accessory Materials: Linseed oil, turpentine, paint thinners and other materials recommended by paint and coatings manufacturer as necessary to achieve finishes specified.

C. Patching and Surface Preparation: Latex fillers as recommended by paint and coatings manufacturer.

2.3 COLORS

A. Colors shall be as selected by Architect. Different colors may be selected for each room, and more than one (1) color may be selected in each room.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site environmental conditions are appropriate, and substrates are in proper condition to receive Work of this Section.

B. Verify that shop applied primers are compatible with specified finish coats.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not begin application of coatings unless moisture content of surfaces is below the following maximum values:
1. Gypsum soffits: 12 percent.
2. Plaster: 12 percent.
3. Masonry surfaces: 12 percent.
4. Wood surfaces: 15 percent.
5. Vertical concrete surfaces: 12 percent.
6. Horizontal concrete surfaces: 8 percent.

3.2 ITEMS TO RECEIVE PAINT

A. Generally, all new items that are normally painted in any typical building, including but not limited to the following list:
1. All ferrous metal
2. All exterior galvanized metal
3. All exterior wood
4. All interior wood
5. All prime coated hardware

6. All exposed conduit, outlet boxes and electrical cabinets, excluding those located in mechanical rooms.
7. All exposed pipe, plumbing, and ductwork, including those located in mechanical rooms.
8. All metal grilles, except aluminum, unless otherwise indicated.
9. All exposed gypsum board surfaces, including all mechanical rooms.
10. All exposed concrete masonry units (CMU), including all mechanical rooms.
11. Miscellaneous other items which normally require painting or are scheduled to be painted.
12. Consult plans, finish schedule, details and specifications for other trades as all items usually field painted or finish will be considered as part of the Contract.
13. All exposed mechanical equipment and electrical equipment.
14. Mechanical Room piping whether insulated or not insulated.
15. All spray applied fireproofing in Mechanical Rooms.
16. All cementitious wood fiber decks and exposed structure scheduled or noted to receive paint. Protect exposed wood structure from overspray.

B. All work where a coat of material has been applied must be inspected and approved by Architect before application of succeeding specified coat, otherwise no credit for coat applied will be given. Notify Architect when a particular coat has been completed for inspection and approval. Apply coats of material in strict accordance with manufacturer's specifications except where requirements of these specifications are in excess of manufacturer's requirements. Paint all sight exposed pipe and plumbing only after all mechanical work and tests have been completed.

3.3 PREPARATION

A. General: Surface must be clean to insure adhesion. Remove oil and grease with paint thinner. Wash off dirt with warm soapy water and rinse with clean water. Remove rust by wire brushing or sanding.

B. Wall surfaces must be dry before painting. Verify with moisture meter.

C. Unfinished Surfaces
1. Wood: Sand smooth and apply one (1) coat of Primer Undercoat. After primer has dried overnight, putty nail holes and cracks, then spot-prime putty with primer. Again, allow the primer to dry over- night, sand lightly and topcoat.
2. Masonry and Concrete: Remove efflorescence or cement dust on masonry and concrete by etching with a 10 percent solution or muriatic (Hydrochloric) acid. Flush off surface after etching with clean water, and paint while still damp. On surface where muriatic acid cannot be used to neutralize the efflorescence, remove the efflorescence by sanding, scraping or wire brushing and apply a coat of Masonry Conditioner before painting. If efflorescence is not present, no primer is necessary on concrete and masonry surfaces. Fill voids and pores in concrete and haydite blocks with Latex Block Filler and allow to dry overnight before topcoating.
3. Iron and Steel: Prime with Metal Primer and allow to dry overnight before topcoating.
4. Galvanized Metal: Prime with galvanized metal primer and allow to dry overnight before topcoating.

3.4 APPLICATION

A. General: Surfaces to be finished must be clean, dry and free of dirt, oils, loose paint or any other contamination that would adversely affect adhesion, protective properties or appearance of the coating.

B. Paint Thickness: Provide the following minimum dry film thickness per coat unless noted otherwise:
1. Enamels on Metal: 1 mil

2. Latex Paints: 1 mil
3. Metal Primers: 1.5 mils
4. Undercoats: 1.5 mils
5. Oil Paints: 1.5 mils
6. Epoxy Coating: 2.0 mils

Thickness test: Use observation gauge that measures "V" shape scratch.

C. Allow exterior paints to dry 72 hours between coats and interior paint to dry 24 hours between coats. Allow all enamels and varnishes to dry 24 hours between coats. If enamel and varnishes are tacky after 24 hours, allow additional time until finish is dry.

D. Leveling: Apply with proper consistency and quality so paint flows out to a level surface free of brush and roller marks, bubbles, dust, runs, sags, and holidays. Spread evenly.

E. Appearance: Uniform color, texture and sheen.

F. Neatness: Paint shall not be smeared, spattered or run over adjoining colors or materials. Cut-on lines shall be straight.

G. First coat shall be white, unless otherwise specified.

3.5 CLEANING AND PROTECTION

A. Keep project premises free of painting-related debris. Collect material that may constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Protect work adjacent to painting operations from paint spatters and spills. Immediately remove paint that falls on finished surfaces not scheduled to receive paint, using materials and techniques that will not damage affected surfaces.

3.6 SCHEDULE

A. The following is a schedule of typical painted items and does not specifically include every item that is to receive paint but should establish type and quality of finish for all items normally included in a complete paint job.

B. Exterior Surfaces: Note: Exterior surfaces are divided into two (2) different categories, based upon color and level of graffiti resistance required. System 1 will be used when standard earthtone colors or neutral colors are specified, and System 2 will be used when bright colors (primary reds, yellows, and oranges) are specified and/or when a graffiti resistant coating is required.

1. Galvanized Metal:
    a. Acid etch galvanized surfaces that have not weathered at least six (6) months prior to beginning painting operations.
    b. One (1) coat 4160 XXXX Devguard Multi-Purpose Tank & Structural Primer.
    c. Two (2) coats 2518 XXXX Ultra-Hide Durus Oil/Alkyd Gloss Exterior House & Trim Enamel.

2. Field Weld Touch-Up on Galvanized Metal:
    a. Two (2) coats Devshield 4130 Rust Penetrating Metal Primer

3. Shop Primed Ferrous Metals:
   a. Clean all bare and abraded areas to bright, bare metal and touch up with either:
      1) 4020 XXXX Devflex DTM Flat Interior/Exterior Waterborne Primer/Finish or 4160 XXXX Devguard Multi-Purpose Tank & Structural Primer.
      2) One (1) coat 4160 XXXX Devguard Multi-Purpose Tank & Structural Primer.
   b. Two (2) coats 2516 XXXX Ultra-Hide Durus Oil/Alkyd Semigloss Exterior House & Trim Enamel.

4. Concrete and CMU:
   a. One (1) coat Bloxfil 4000 Interior/Exterior Heavy Duty Acrylic Block Filler.
   b. Two (2) coats 2220 XXXX Ultra-Hide Durus Exterior Acrylic Flat Masonry Finish.

5. Wood (Includes plywood siding and wooden trim):
   a. One (1) coat 2010 Ultra-Hide Primecoat Latex.
   b. Two (2) coats 2210 XXXX Ultra-Hide Durus Flat Latex Exterior House Paint.

6. Fiber-Cement Materials:
   a. Primer: One (1) coat Loxon Masonry Primer (A24W300)
   b. Finish: Two (2) coats A-100 Acrylic Gloss (A8 Series)

7. Parking Line and Driveway Paint: Setfast Waterborne Yellow (TM225) (meets Federal Specification (FS) TTP-1952-B)

8. All piping in mechanical rooms shall be painted in their entirety, in the following colors:
   a. Gas lines: Orange
   b. Domestic cold water: White
   c. Domestic hot water: Pink
   d. Heating hot water: Red
   e. Condenser water: Green
   f. Chilled water: Blue

C. Interior Surfaces:
1. Gypsum Drywall:
   a. Ceilings and locations not scheduled to receive enamel finish.
      1) One (1) coat 1030 Ultra-Hide PVA Interior Primer Sealer with texture added.
      2) Two (2) coats 1230 XXXX Ultra-Wall Latex Flat Interior Wall Paint.

   b. Walls scheduled to receive enamel paint.
      1) One (1) coat 1030 Ultra-Hide PVA Interior Primer Sealer with texture added.
      2) Two (2) coats 1412 XXXX Ultra-Hide Latex Eggshell Interior Wall and Trim Enamel.

2. Wood: (Painted)
   a. One (1) coat 1120 Ultra-Hide Alkyd Prime 'N Finish Flat primer.
   b. Two (2) coats 1516 XXXX Ultra-Hide Alkyd Semigloss Interior Wall and Trim Enamel.

3. Wood: (Stained)
   a. Two (2) coats Olympic Interior Water Based Polyurethane clear gloss finish.

4. Shop-Primed Ferrous Metals (Use for metal doors and frames and miscellaneous metal items):
   a. Shop coat by others.
   b. Touch up bare areas with 4160 XXXX Devguard Multi-purpose Tank & Structural Primer.
   c. One (1) coat 4160 XXXX Devguard Multi-purpose Tank & Structural Primer.
   d. Two (2) coats 1516 XXXX Ultra-Hide Alkyd Semigloss Interior Wall and Trim Enamel.

5. Galvanized Metals (Use for all exposed interior galvanized metal):
   a. Clean and acid etch as necessary.
   b. One (1) coat 4160 XXXX Devguard Multi-purpose Tank & Structural Primer.
   c. Two (2) coats 1516 XXXX Ultra-Hide Alkyd Semigloss Interior Wall and Trim Enamel.

6. Concrete Block (CMU):
   a. General: Stop block filler and paint 1/2 inch below top of floor base material at all wall surfaces.
   b. Alkyd Enamel (Corridors, Classrooms, Offices, and where shown on drawings):
      1) One (1) coat Bloxfil 4000 Interior/Exterior Heavy Duty Acrylic Block Filler.
      2) Two (2) Devflex 4216 High Performance Waterborne Acrylic Semi-gloss Enamel

7. Epoxy (Kitchen, and where shown on drawings):
      1) One (1) coat Bloxfil 4000 Interior/Exterior Heavy Duty Acrylic Block Filler.
      2) Two (2) coats 4406 XXXX Tru-Glaze-WB Waterborne Epoxy Semigloss Coating.

END OF SECTION

SECTION 09 97 23

CONCRETE FLOOR SEALER

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Application of membrane type curing and sealing compound on concrete surfaces to remain exposed.

PART 2 - PRODUCT

2.1 APPROVED MANUFACTURER

A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications, comply with Division 1 requirements regarding substitutions to be considered and have Architect's approval prior to its use on the Project.
   1. Dayton-Superior Corp
   2. Euclid Chemical Company
   3. W.R. Meadows, Inc. (Basis of Specification)

2.2 MATERIALS

A. Typical, except as noted: Membrane type curing and sealing compound conforming to ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete, Type I, Class B and complying with Sealtight "Vocomp-20" as manufactured by W.R. Meadows, Inc., Fort Worth, TX; (817) 834-1969.

B. Exterior Non-slip Traffic Coating: "Vocomp-20" as specified above, with "Sure-Step" slip-resistant additive as manufactured by W.R. Meadows, Inc., Fort Worth, TX; (817) 834-1969.

PART 3 - EXECUTION

3.1 APPLICATION

A. Concrete slabs shall be smooth, dry, and free of any foreign materials.

B. Apply two (2) coats of specified finish in accordance with manufacturer's instructions.

C. Allow approximately 24 hours drying time between installation of coats. Do not apply second coat until Architect has inspected first coat application.

D. Install coating after all painting operations are completed.

END OF SECTION

SECTION 10 01 00

MISCELLANEOUS SPECIALTIES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Install the following Owner furnished items. The following items will be furnished the Contractor on a timely basis for installation into the work:
1.

B. Furnish and install the following:
1. Plasma TV Mounting Brackets
2. Rapid Entry System (Fireman's Lock Box)

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete

B. Section 04 20 00 - Unit Masonry

C. Section 05 50 00 - Miscellaneous Metals: Metal bracing, fasteners and other support components

D. Section 06 10 00 - Rough Carpentry: Wood blocking

E. Section 09 21 16 - Gypsum Board Assemblies

F. Section 09 51 00 - Acoustical Ceilings

G. Division 26 – Electrical

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer's installation instructions.
3. Manufacturer's operation and maintenance data, as applicable.

B. Shop Drawings: Show sizes, locations and installation details. Include utility (electrical, water, gas) requirements.

C. Samples: Color charts showing manufacturer's full range of colors.

1.4 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination.

1.5 COORDINATION

A. Coordinate Work of this Section with work of other sections in which items are to be installed.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Specifications are based on named products and manufacturers. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

2.2 MATERIALS

A. Plasma/LCD Monitor Mounting Brackets:
   1. Wall Mounted Brackets for mounting on wood studs or masonry wall:
      a. Features:
         1) Universal adapter plate included
         2) Pull-out swivel with up to 360° rotation depending on screen size
         3) Locking tab provides optional swivel restriction to one side
         4) 3.4" deep in closed position, up to 11.9" fully extended
         5) 0°, 20° lockable incremental tilt
         6) +/-1° roll for horizontal screen alignment during installation
         7) Built-in cord management
         8) Lock KeyTM installation tool secures arms for screen installation
         9) Lock-out screw prevents unwanted extension
         10) Mounts to 16" wood studs, concrete, cinder block
         11) Includes mounting and screen attachment hardware
      b. Size: Capable of securely holding a 50-71 inch plasma / television, as required,and furnished by Owner.
      c. Color: Black
      d. Number/Location: As shown on drawings.
      e. Approved Product/Manufacturer: Model No. PLCM-UNL as manufactured by Peerless Industries, Inc., Melrose Park, IL; (708) 865-887 or equivalent manufactured by Bretford Manufacturing, Inc., Schiller Park, IL; (800) 521-9614; Lucasey Mfg. Corp., Oakland, CA: (800) 582-2739; or Architect approved equal.
      f. **Provide Sanus #VLF 220-B1**

B. Rapid Entry System (Fireman's Lock Box)
   1. Fire Department Lock Box (main entry): Knox Company No.3200 recessed, with recessed mounting kit. Contractor shall coordinate with Fire Department's requirements. Provide One (1) at location coordinated with the Fire Marshal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify utility (electrical, water, and gas) requirements, where applicable, are installed and ready for connection.

B. Verify items fastened to walls have proper blocking or support items installed.

C. Verify locations for items are ready for their installation.

3.2 INSTALLATION

A. Install all items in accordance with manufacturer's printed instructions in locations shown on drawings.

B. Bolt fasten floor safe securely in location indicated on drawings.

C. Fasten curtain track securely in straight and level position, mounted as detailed and install curtain.

D. Fasten TV brackets securely to walls where indicated on drawings.

E. Fasten corner guards in place with screws with bottom of corner guard at top of scheduled base at all field applied vinyl wall covering.

F. Install wall padding panels in locations shown on drawings with minimum amount of wrinkles in fabric.

G. Install projection screen housing in conjunction with installation of ceiling system. After interior construction is essentially complete, install viewing surface and operating mechanism in housing. Install screens securely to supporting substrate so that screens are level and back of case is plumb. Provide required brackets, hanger rods, and fasteners.

3.3 CLEANING AND ADJUSTING

A. Make final adjustment after installation and clean all backstop support piping of dirt and other substances which may affect final finish.

B. Clean all items of dirt and foreign matter which may affect appearance and operation.

C. Adjust items for proper operation.

D. Instruct Owner’s personnel on proper operation and maintenance of items.

END OF SECTION

SECTION 10 14 00

GRAPHICS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Include in Base Proposal the amount for furnishing and installing the following signage for the project:
   1. Dedication plaque
   2. Cast Metal exterior wall mounted facility name
   3. Room Identification Signage
   4. Brackets, clips, posts, fasteners, concrete footings, and all accessories required for proper installation of signage.

B. Include in proposal the cash allowance stated in Section 01 21 00 for graphics on the Project as selected and directed by the Architect. Included in the cash allowance is the amount for the furnishing and installing the following:
   1. None

1.2 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions.

B. Shop Drawings:
   1. Indicating materials, sizes, and finishes, details of fabrication and installation, fasteners and hardware, attachments, related and adjacent work.
   2. Rubbing of actual pattern of cast metal plaque for Architect's approval prior to casting.

C. Samples:
   1. One (1) 6 inch x 6 inch sample of cast metal plaque material with specified finish.
   2. One (1) 4 inch actual sample of cast metal letter in specified letter style and finish.
   3. One (1) actual sample of each type room identification sign with specified finish.

1.3 QUALITY ASSURANCE

A. Americans with Disabilities Act (ADA)
B. Texas Accessibility Standards (TAS)

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Specifications are based on products and manufacturers listed as basis of specification or named. Products of manufacturers listed which meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and

comply with Division 1 requirements regarding substitutions to be considered.

2.2 MATERIALS

A. Cast Metal Dedication Plaque:
1. Material and Fabrication:
   a. Casting: Shall be of virgin ingots of F-214 Aluminum Alloy and shall be free of pits and gas holes and all letters shall be sharp and hand tooled.
   b. Border Style: Single line standard border design.
   c. Letter Style/Sizes: Shall be Helvetica Medium in both upper- and lower-case letters, unless shown otherwise. Letter sizes shall be as shown on drawings.
   d. Finishes:
      1) Borders and Letter Faces: Shall be satin finish.
      2) Background: Shall be leatherette texture sprayed with Gun Metal Gray acrylic lacquer.
      3) Plaque shall be chemically cleaned and etched and treated with alodine.
      4) Completed plaque shall be sprayed with two (2) coats of clear acrylic lacquer.
   e. Size: Shall be as shown on drawings.
2. Fasteners and Attachment Hardware: Concealed fasteners and hardware of size and type recommended by manufacturer for attachment of plaque on brick wall where indicated on drawings.
3. Provide all materials required for a complete installation.
4. Approved Manufacturers:
   a. A.R.K. Ramos Architectural Signage Systems, Oklahoma City, OK; (405) 235-5505
   b. Benchmark Signs, Benbrook, TX; (817) 560-9965
   c. Best Manufacturing Sign Systems, Montrose, CO; (800) 235-2378
   d. York Bronze Company, Bryan, TX; (800) 488-4662
   e. Gemini Incorporated, Cannon Falls, MN; (800) 538-8377
   f. Matthews Bronze, Pittsburgh, PA; (800) 950-1317
   g. Metal Arts, Division of L & H Mfg. Co., Mandan, ND; (800) 237-8069
   h. ProWorx Architectural Signage, Houston, Texas; (713) 666-3131
   i. The Southwell Co., San Antonio, TX; (210) 223-1831 (Basis of Specification)

B. Cast Metal Letters:
1. Material and Fabrication:
   a. Casting shall be of 319 aluminum alloy with satin polished faces and matte sides.
   b. Letters shall be finished in clear anodized finish.
   c. Letters shall be 24 inch high in Helvetica Medium upper case letters, unless shown otherwise.
2. Fasteners and Attachment Hardware: Concealed fasteners and hardware of size and type recommended by manufacturer for attachment of letters on brick wall where indicated on drawings.
3. Provide all materials required for a complete installation.
4. Approved Manufacturers:
   a. A.R.K. Ramos Architectural Signage Systems, Oklahoma City, OK; (405) 235-5505
   b. Benchmark Signs, Benbrook, TX; (817) 560-9965
   c. Best Manufacturing Sign Systems, Montrose, CO; (800) 235-2378
   d. York Bronze Company, Bryan, TX; (800) 488-4662

e. Gemini Incorporated, Cannon Falls, MN; (800) 538-8377
f. Matthews Bronze, Pittsburgh, PA; (800) 950-1317
g. Metal Arts, Division of L & H Mfg. Co., Mandan, ND; (800) 237-8069
h. ProWorx Architectural Signage, Houston, Texas; (713) 666-3131
i. The Southwell Co., San Antonio, TX; (210) 223-1831 (Basis of Specification)

C. Room Identification Signage:
1. General:
a. Constructed of one (1) or two (2) high pressure laminate in colors selected by Architect, laminated to a 1/8 inch thick acrylic back.
b. Signage shall have radius or square corners with square-cut edges painted a color as selected by Architect.
c. Demarcation line, if any, shall be infilled to match copy color.
d. Signs shall comply with all state and federal codes, including, but not limited to the ADA and TAS requirements.
e. Refer to drawings for signage details for dimensions, types, colors, graphic layout, and mounting and height specifications.
2. Room Numbers, Symbols, and Restroom Copy:
a. Shall be matte finished acrylic, raised 1/32 inch, of a color contrasting to the face laminate.
b. Characters and pictograms shall be chemically welded to the acrylic backing, through the face laminate, to assure permanent adhesion.
c. Room numbers and restroom copy shall be accompanied by Grade II braille by means of “VisiTouch Duradot System”. Glass or metallic “Durodots” shall have 0.059 inch surface diameter with body of sphere pressure secured below face laminate. Routed boxes or glued on dots are not acceptable.
3. Lower or Secondary Copy:
a. Shall be a minimum of 5/8 inch high incised sans serif style, (Helvetica, Optima, Futura as selected by Architect), all caps, paint-filled in a color as selected by Architect.
4. Restroom Pictograms:
a. Shall appear on a minimum six (6) inch square, unobstructed field.
5. Window (Slotted) Signs:
a. Shall be open on both ends for an insert by Owner, window shall be a non-glare acrylic window, with an exposed color laminate behind in color as selected by Architect.
6. Fasteners and Accessories:
a. 1/8 inch thick, double-sided foam tape of type recommended to suit application and commercial grade silicone sealant.
b. Back-up plates shall be supplied, where shown or required, for signage mounted on glass.
7. Provide all materials required for a complete installation.
8. Approved Manufacturers:
a. Signage:
1) South Texas Graphic Specialties, Inc., Houston, TX; (713) 467-4499 (Basis of Specification)
2) Benchmark Signs, Benbrook, TX; (817) 560-9965
3) Stanley Signature Signs, Katy, Texas; (281) 395-6106
4) ProWorx Architectural Signage, Houston, Texas; (713) 666-3131
5) Motivational Systems, Inc. San Antonio, TX; (210) 805-9555
b. Plastic Laminate:
1) Wilsonart International, Temple, TX; (800) 433-3222

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cast Metal Dedication Plaque:
1. Install in accordance with manufacturer's instructions.
2. Install in location shown on drawings.
3. Install with concealed fasteners of threaded bolt screwed into back of plaque and inserted into hole drilled in brick at an angle and filled with cement.

B. Cast Metal Letters:
1. Install in accordance with manufacturer's instructions.
2. Install in location shown on drawings
3. Install with concealed fasteners in flush mounting or projected mounting as shown on drawings.

C. Room Identification Signs:
1. Install in accordance with manufacturer's instructions.
2. Install in locations shown on drawings.
3. Install with double-sided foam tape and a bed of silicone sealant.
4. Where shown or required, mount signs on glass using back-up plates.

END OF SECTION

SECTION 10 15 00

ALUMINUM FLAGPOLE

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aluminum flagpole in location shown on drawings, with all fittings, accessories, bases and anchorage devices shown on drawings, specified or required for a complete installation.

1.2 RELATED WORK

A. Section 02050 - Selective Demolition: Removal of existing flagpole and foundation.

B. Section 02200 - Earthwork

1.3 QUALITY STANDARDS

A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases and anchorage devices.

B. Design Criteria: Provide flagpole and installation constructed to withstand a 144 mph windspeed unflagged, and a 120 mph windspeed when flying a 6 feet-0 inch x 10 feet-0 inch flag.

C. Pole Construction: Construct pole and ship to site in one (1) piece if possible. If more than one (1) piece is necessary, provide snug-fitting precision joints with self aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

1.4 SUBMITTALS

A. Product Data:
1. Manufacturer’s specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer’s installation instructions.
3. Manufacturer's operation and maintenance data.

B. Shop Drawings: Show general layout, dimensions, base details, anchorage, finishes and components of system.

1.5 DELIVERY, STORAGE AND HANDLING

A. Spiral wrap flagpole with heavy Kraft paper or other protective wrapping, and prepare for shipment in hard fiber tubes or other protective container.

B. Deliver flagpole and accessories completely identified for installation procedure. Handle carefully to avoid soiling or damage, and store flagpole unwrapped to avoid staining from wrappings.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers listed who produce equivalent products to those specified are approved on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions to be considered.
1. AAA Manufacturing and Supply Company of America, Div., Award Masters Inc., Pensacola, Fl; (800) 800-4804

2. Adams Flagpole, Woburn, MA; (800) 992-6255
3. American Flagpole, Inc., Abingdon, VA; (800) 368-7171
4. Baartol Co., Inc., Kenton, OH; (800) 537-4143
5. Carrot-Top Industries, Inc., Hillsborough, NC; (800) 628-3524
6. Concord Industries, Inc., Dallas, Texas; (800) 527-3902
7. Eder Flag Manufacturing Co., Oak Creek, WI; (800) 558-6044
8. John Ewing & Co., Inc., Agincourt, Ontario, Canada; (800) 663-7653
9. Morgan-Francis Div. of Original Tractor Cab, Arlington, IN; (800) 814-9568
10. Pole-Tech Company, Inc., East Setauket, New York; (800) 633-6733

B. Specifications are based on products of Concord Industries, Inc.

2.2 FLAGPOLE

A. Material: Fabricate from seamless extruded aluminum tubing complying with ASTM B241, alloy 6063-T6, tensile strength not less than 30,000 psi and a yield point of 25,000 psi. Heat-treat and age harden after fabrication.

B. Description:
1. Type: Commercial ground set cone-tapered aluminum flagpole.
2. Exposed Height: 35 feet-0 inches above ground.
3. Overall Height: 38 feet-6 inches.
4. Butt Diameter: 7 inches.
5. Top Diameter: 3.5 inches
6. Wall Thickness (Maximum): 0.188 inch
7. Length:
   a. Tapered Portion: 20 feet-0 inches.
   b. Straight: 18 feet-6 inches.
8. Finish: No. 80 grit clear anodized finish.
9. Quantity: Two (2) shall be furnished and installed on the project.

2.3 FLAGPOLE MOUNTING

A. Ground Mount:
1. Foundation Tube: Sleeve shall be fabricated from 16 gauge galvanized steel, with a steel base plate whose square dimension shall be at least four (4) inches larger than the inside diameter of the sleeve.
2. Setting Plate: Shall be six (6) inch square steel plate securely welded to the ground spike.
3. Ground Spike: Shall be a 3/4 inch diameter steel rod not less than 18 inches long.
4. Flash Collar: Spun aluminum collar conforming to Type FC-11 finished to match flagpole shaft with diameter at least one (1) inch larger than sleeve.

2.4 FLAG

A. Provided by Owner.

2.5 FITTINGS

A. Finial: Six (6) inch diameter aluminum ball in color to match flagpole shaft.

B. Truck: Cast aluminum revolving, non-fouling, complete with stainless steel ball bearings and two (2) 2-3/8 inch diameter cast nylon sheaves.

C. Halyards: braided polypropylene

D. Cleats: Two (2) 9 inch cast aluminum cleats, with stainless steel socket-head bolts included.

E. Cleat Cover: Shall be complete with key operated cylinder lock and shall completely cover cleat when closed. Cover finish shall match flagpole shaft.

2.6 SETTING MATERIAL

A. Concrete: Provide concrete composed of not less than five (5) sacks of Portland cement conforming to ASTM C150, per cubic yard of wet concrete combined with fine aggregate, clean water, and mixed in proportions to attain minimum 28 day compressive strength of not less than 3,000 psi.

2.7 ACCESSORY MATERIALS

A. Bituminous Paint: Type recommended by manufacturer to paint portion of flagpole below ground.

B. Sand: Type recommended by manufacturer.

C. Wedges: Type recommended by manufacturer.

D. Sealant: Type recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required due to unstable soil conditions. Remove wood, loose soil, rubbish and other foreign matter from excavation, and moisten earth before placing concrete.

B. Place concrete immediately after mixing. Place concrete to avoid segregation of mix. Compact concrete in place by use of vibrators to consolidate. Moist cure exposed concrete for not less than seven (7) days or use non-staining curing compound in freezing weather. Finish trowel exposed concrete surface to a smooth, dense surface. Provide positive slope for water runoff to base perimeter.

C. Paint below ground portions of flagpole with heavy coat of bituminous paint.

D. Install flagpole, with fittings and accessories straight and true in location shown on drawings in accordance with manufacturer's instructions and approved shop drawings.

E. Provide positive lightning ground.

3.2 CLEANING AND ADJUSTING

A. Clean area of debris and place excavated soil where directed or remove from site as directed.

B. Clean flagpole of dirt and foreign matter which will affect appearance.

C. Touch up damage to finished surfaces with manufacturer’s matching paint.

D. Check and adjust fittings for smooth operation.

END OF SECTION

SECTION 10 21 13.21

SOLID PHENOLIC TOILET PARTITIONS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid Phenolic (SPC) Core toilet partitions, floor mounted, overhead braced.

1.2 SUBMITTALS

A. Shop Drawings: Within four (4) weeks of award of contract, submit:
1. Complete shop drawings for the Architect's approval, showing all required field measurements, all details and elevations, plans and sections required to indicate all conditions.
2. Manufacturer's installation instructions.

B. Certification: Provide a certificate of compliance attesting that all materials are in accordance with manufacturer’s specifications.

1.3 FIELD MEASUREMENTS

A. Field verify dimensions prior to submittals and fabrication.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ampco Products, Inc., Sanger, TX (940) 458-7401 or comparable product by one of the following:
1. Accurate Partitions Corporation, Lyons, IL; (708) 442-6801
2. Bobrick Washroom Equipment, Inc., North Hollywood, CA; (281) 362-7575
3. Bradley Corporation, Menomonee Falls, WI; (800) 272-3539
4. DesignRite Partitions (Spec-Rite Designs), St. Louis, MO; (877) 249-6864
5. Flush-Metal Partition, Maspeth, NY; (718) 784-3380
6. General Partitions Mfg. Corp., Erie, PA; (814) 833-1154
7. Global Steel Products Corp., Deer Park, NY; (631) 586-3330
8. Knickerbocker Partition Corp., Irving, TX; (972) 438-5330
9. Metpar Corp., Westbury, NY; (516) 333-2600
10. Partition Systems, Inc. (Columbia Partitions), Columbia, SC; (803) 765-9980
11. Tex-Lam Manufacturing, Inc., Houston, TX; (713) 695-5975

2.2 MATERIALS

A. General: Comply with the Americans with Disabilities Act (ADA) and Texas Accessibility Standards (TAS).

B. Doors: 3/4 inch thick solid phenolic core with high pressure melamine color surface on faces. Edges shall be burnished and slightly rounded. Standard door size, other than “accessible”, is 24 inches, unless indicated otherwise.

C. Panels: 1/2 inch thick solid phenolic core with high pressure color surface on faces. Edges shall be burnished and slightly rounded.

D. Pilasters: 3/4 inch thick, minimum, solid phenolic core with high pressure color surface on faces. Edges shall be burnished and slightly rounded.

E. Headrail: heavy duty aluminum extrusions, anodized with anti-grip configuration, and shall be fastened to the pilaster tops.

F. Hardware: Hinges shall be fabricated from 11 gauge stainless steel, one piece leaf, for surface mounting. Hinge shall be equipped with one piece 3/8 inch stainless steel pintle extending the full height of the hinge. Upper and lower hinge are to both be cam operated, with the one piece pintle.
1. Coat hook and bumper to be 14 gauge stainless steel.
2. Door strike and keeper shall be 14 gauge stainless steel.
3. Bracket for wall and partition attachment shall be continuous 14 gauge stainless steel.
4. Pilaster shall be attached to the floor by means of an 11 gauge stainless steel footer, with provisions for leveling, attached to two (2) 3/8 inch diameter stainless steel studs set into expansion shields. The floor connections are to be covered by a four (4) inch high stainless steel shoe, #4 finish.

G. Finish: Melamine color surface on material face, edges burnished. All wood grain panels larger than 57-1/4 inches will have horizontal grain.

H. Color: Shall be selected from the manufacturer's high pressure plastic laminate color chart. The colors available shall be the same as offered for plastic laminate partitions. Core shall be black.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Install all toilet partitions where indicated on the drawings, and as indicated on the shop drawings, anchoring all components firmly in place for long life under hard use and in complete accordance with the manufacturer's recommendations.

C. Provide blocking/anchoring devices to secure to wall. Anchoring devices must be compatible to wall type to ensure adequate strength.

3.2 CLEANING AND ADJUSTING

A. Clean surfaces free of dirt, oil, grease and other contaminants which detract from appearance of partitions.

B. Except for compartments for the handicapped, adjust doors to remain at a uniformly open position when unlocked.

3.3 REPLACEMENT OF DEFECTIVE MATERIALS

A. Defaced, damaged, scratched or marred materials will not be permitted, will be considered defective, and rejected. Rejected materials shall be replaced with new materials at no additional expense to Owner.

END OF SECTION

SECTION 10 22 13

WIRE MESH PARTITIONS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standard-duty wire mesh partitions.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wire mesh items.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: Submit color selection chart indicating manufacturer's full range of standard colors.

D. Samples for Verification: 12-by-12-inch panel constructed of specified frame members and wire mesh. Show method of finishing members at intersections.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain wire mesh items from single source from single manufacturer.

B. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Any one (1) of the manufacturer's listed who produce equivalent products to those specified are approved for use on the Project. Other manufacturers must have a minimum of five (5) years' experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions to be considered.
   1. Acorn Wire and Iron Works, Inc.
   2. California Wire Products Corp.
   3. Central Wire & Iron Works
   4. G-S Company Wire & Iron Works
   5. Indiana Wire Product
   6. Kentucky Metal Products Co.
   7. Standard Wire & Steel Works
   8. Superior Wire and Metal Products, Inc.
   9. Wipco Wire Partitions

2.2 MATERIALS

A. Steel Wire: ASTM A 510.

B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.

C. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

D. Steel Pipe: ASTM A 53/A 53M, Schedule 40 unless another weight is indicated or required by structural loads.

E. Square Steel Tubing: ASTM A 500, cold-formed structural-steel tubing.

F. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.

G. Postinstalled Expansion Anchors: With capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

2.3 STANDARD-DUTY WIRE MESH PARTITIONS

A. Partitions:
1. Mesh: 0.135-inch-diameter, intermediate-crimp steel wire woven into 1-1/2-inch diamond mesh.
2. Vertical Panel Framing: 1-1/4 inch by 5/8 inch by 0.097-inch cold-rolled, C-shaped steel channels with 1/4-inch-diameter bolt holes spaced not more than 18 inches o.c. along center of framing.
3. Horizontal Panel Framing: 1-by-1/2-by-1/8-inch cold-rolled steel channels.
4. Top Capping Bars: 2-1/4 inch by 1 inch cold-rolled steel channels.
5. Posts for 90-Degree Corners: 1-1/4 inch by 1-1/4 inch by 1/8-inch steel angles with 1/4-inch-diameter bolt holes aligning with bolt holes in vertical framing; with floor anchor clips.
6. Floor Shoes: Steel or cast iron not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

B. Swinging Doors (as shown on Drawings): Fabricated from same mesh as partitions, with framing fabricated from 1-1/4 inch by 1/2 inch by 1/8-inch steel channels or C-channels, banded with 1-1/4 inch by 1/8-inch flat steel bar cover plates on three (3) sides, and with 1/8-inch-thick angle strike bar and cover on strike jamb.
1. Hinges: Full-surface type, 3-by-3-inch steel, 1-1/2 pairs per door; bolted, riveted, or welded to door and jamb framing.
2. Cylinder Lock: Mortise type with manufacturer's standard cylinder, keyed to Owner’s master keyed system, operated by key outside and recessed knob inside.
3. Inactive Leaf Hardware: Cane bolt at bottom and chain bolt at top.

C. Sliding Doors (as shown on Drawings): Fabricated from same mesh as partitions, with framing fabricated from 1-1/2 inch by 3/4 inch by 1/8-inch steel channels or C-channels, banded with 1-1/2 inch by 1/8-inch flat steel bar cover plates on four (4) sides.
1. Hardware: Two, four-wheel roller-bearing carriers, box track, and bottom guide channel for each door.

2. Cylinder Lock: Mortise type with manufacturer's standard cylinder, keyed to Owner's master keyed system, operated by key outside and recessed knob inside.

D. Miscellaneous: All bolts, hardware, and accessories for complete installation to be included. Field bracing furnished by erector.

2.4 FABRICATION

A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. As required for complete installation, provide bolts, hardware, and accessories with manufacturer's standard finishes.

B. Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated in full height to bottom of structure above or to heights indicated on Drawings. Finish edges of cutouts to provide a neat, protective edge.
1. Mesh: Securely clinch mesh to framing.
2. Framing: Fabricate framing with mortise and tenon corner construction.
   a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
   b. Fabricate three- and four-way intersections using intersection posts or manufacturer's standard connecting clips and fasteners.
   c. Fabricate partition and door framing with slotted holes for connecting adjacent panels.
3. Fabricate wire mesh partitions with 3 inches of clear space between finished floor and bottom horizontal framing.
4. Doors: Align bottom of door with bottom of adjacent panels.
   a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
5. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

C. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish, suitable for use indicated, consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where wire mesh items will be installed.

C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install the Work of this Section in accordance with the manufacturer's recommendations and shop drawings as approved by the Architect, anchoring all components firmly into position, true to line, and aligned horizontally and vertically to achieve level and plumb installation.

B. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION

SECTION 10 26 00

CORNER GUARDS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flush (recessed) mounted corner guards, with mounting fasteners and accessories required to install corner guards at outside corners of gypsum wallboard walls.

1.2 RELATED WORK

A. Section 04200 - Unit Masonry

B. Section 06220 - Finish Carpentry and Millwork

C. Section 09250 - Gypsum Wallboard Systems

D. Section 09650 - Resilient Tile Flooring and Base: Resilient base.

E. Section 09900 - Painting and Staining: Wall finishes.

F. Section 09952 - Vinyl Wall Covering

G. Section 10262 - Wall Protection

1.3 REFERENCES

A. ASTM International (ASTM)
1. B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
2. D1308, Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
3. E84, Standard Test Method for Surface Burning Characteristics of Building Materials
4. F476, Standard Test Methods for Security of Swinging Door Assemblies

B. Building Code

C. Underwriters' Laboratories, Inc. (UL)

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer who has no less than three (3) years experience in installation of systems similar in complexity to those required for this Project.

B. Manufacturer's Qualifications (If other than those specified): Not less than five (5) years experience in the production of specified products and a record of successful in-service performance.

C. Code compliance: Assemblies should conform to all applicable codes and Life Safety codes.

D. Fire Performance Characteristics: Provide wall protection system components with UL label indicating that they are identical to those tested in accordance with ASTM E84 for Class 1 characteristics listed below:
   1. Flame spread: 25 or less
   2. Smoke developed: 450 or less

E. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.

F. Chemical and Stain Resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D1308.

G. Color Match: Provide wall protection components that are color matched in accordance with the following:
   1. Delta E difference of no greater than 1.5 using the Hunter (Lab) Scale. Note that manufacturer's colors are matched under cool white fluorescent lighting and computer controlled within manufacturing tolerances. Color may vary if alternate lighting sources are present).

H. Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.

1.5 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements of each type corner guard specified.
   2. Manufacturer's installation requirements.
   3. Manufacturer's cleaning and maintenance instructions.

B. Shop Drawings: Show locations of each item and installation details. Provide elevations of non-standard conditions.

C. Samples:
   1. Color charts consisting of actual product pieces, demonstrating full range of available colors, for Architect's color selection.
   2. 12 inch long piece in full size profiles of corner guard in color selected.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in unopened original factory packaging clearly labeled to show manufacturer.

B. Store materials in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to the elements. A minimum room temperature of 40 degrees F and a maximum of 100 degrees F shall be maintained.

C. Material must be stored flat.

1.7 PROJECT CONDITIONS

A. Materials must be acclimated in an environment of 65 degrees - 75 degrees F for at least 24 hours

prior to beginning the installation.

B. Installation areas must be enclosed and weatherproofed before installation commences.

1.8 WARRANTY

A. Warranty the Work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed below whose product meets or exceeds the specification are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
1. American Floor Products, Inc., Gaithersburg, MD
2. Arden Architectural Specialties, Inc., St Paul, MN
3. Tepromark International, Inc. (Formerly Balco), Evanston, IL
4. Construction Specialties, Inc., Muncy, PA
5. IPC, InPro Corporation, Muskego, WI
6. Koroseal Wall Protection Systems, A Division of RJF International Corporation (Distributed by Wallcoverings International, Houston, TX)
7. Pawling Corporation, Standard Products Division, Wassaic, NY

B. Specifications are based on products manufactured by Construction Specialties, Inc., Muncy, PA.

2.2 MATERIALS

A. Vinyl/Acrylic: Extruded material should be high impact Acrovyn with pebblette grain texture, 0.078 inch thickness. Chemical and stain resistance should be per ASTM D1308 standards as established by the manufacturer. Colors shall be as selected by Architect from manufacturer's standard color range.

B. Aluminum Retainers: Extruded aluminum retainers should be 6063-T6 alloy, 0.063 inch thickness. Minimum strength and durability properties as specified in ASTM B221.

C. Fasteners: All fasteners to be non-corrosive and compatible with aluminum retainers. All necessary fasteners to be supplied by the manufacturer.

2.3 CORNER GUARDS

A. Vinyl/Acrylic corner guards shall be flush (recessed) mounted guards consisting of continuous aluminum retainer with snap-on cover. Attachment hardware shall be appropriate for wall construction.
1. Model FS-10, Bullnose shaped flush mounted corner guard with three (3) inch legs. Color shall be as selected by Architect from manufacturer's full line of available colors.
2. Model FSC-25R, Full Height One (1) hour rated flush mounted corner guard / partition end cap with two (2) inch legs for end wall condition. Includes fire barrier for one (1) hour fire rating. Color shall be as selected by Architect from manufacturer's full line of available colors.

2.4 FABRICATION

A. General: Fabricate corner guard system to comply with requirements indicated for design, dimensions, detail, finish and member sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.

B. Protection: Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

3.3 INSTALLATION

A. Install Work of this Section in strict accordance with the manufacturer's recommendations, using only approved mounting hardware, and locating all components firmly into position, level and plumb.

B. Temperature at the time of installation must be between 65 degrees - 75 degrees F and be maintained for at least 48 hours after the installation.

3.4 CLEANING

A. General: Immediately upon completion of installation, clean vinyl covers and accessories in accordance with manufacturer's recommended cleaning method.

B. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.5 PROTECTION

A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION

SECTION 10 28 13

TOILET ROOM ACCESSORIES

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet accessories; shower accessories; and utility room accessories.

1.2 RELATED SECTIONS

A. Section 04 20 00 - Masonry.

B. Section 05 40 00 – Cold Formed Metal Framing

C. Section 09 21 16 - Gypsum Board Assemblies

D. Section 09 30 13 - Ceramic Tile

E. Section 10 21 13.19 - Toilet and Shower Compartments

F. Division 26 - Electrical

1.3 OWNER FURNISHED / CONTRACTOR INSTALLED ITEMS

A. The Owner shall furnish the following items to the Contractor in a timely basis for installation into the work: N/A

B. Contractor shall furnish and install other items specified or shown on drawings.

1.4 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and technical data.
2. Manufacturer’s installation instructions.
3. Manufacturer’s operation and maintenance instructions of units specified.
4. Provide schedule of materials and installation locations.

B. Shop drawings: Indicate size, material and finish. Show locations, installation procedures. Include details of joints, attachments, fasteners, clearances, and mounting heights.

1.5 MINIMUM COMPLIANCE STANDARDS

A. Comply with ANSI A117.1 and Texas Accessibility Standards (TAS) and with referenced standards specified with each product or material.

1.6 QUALITY STANDARDS

A. Design, finish and keying of items shall be the same.

B. Furnish items from one (1) manufacturer only unless otherwise specified or directed by Architect.

1.7 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13 – Project Coordination

1.8 COORDINATION

A. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.9 WARRANTY

A. Warrant the work specified herein for three (3) years, or provide manufacturer's standard warranty for specified products, against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.

B. Defects shall include, but not be limited to:
1. Delamination or deterioration of finish
2. Noisy, rough or difficult operation
3. Failure to meet specified quality assurance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed whose products meet or exceeds the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
1. A & J Washroom Accessories
2. American Specialties, Inc. (ASI)
3. Bobrick Washroom Equipment, Inc
4. Bradley Corp.
5. Koala Bear Kare (Diaper Changing Station)

B. Specifications are based on products of Bobrick Washroom Equipment, Inc., (281) 362-7515.

2.2 COMPONENTS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Stainless Steel:
1. Stainless Steel Sheet: ASTM A666 Type 302 or 304.
2. Stainless Steel Tubing: ASTM A269, stainless steel.
3. Finish: No. 4 satin, unless otherwise specified
4. Thickness: 22 US Stainless gauge minimum

C. Chromium Plating:
   1. Method: Over nickel
   2. Standard: ASTM C456, Type SC 2

D. Mirrors (Framed):
   1. Standard: FS DD-G-451-C, silvering quality No. 1 float or plate
   2. Thickness: 1/4 inch
   3. Backing: Electrolytic cooper
   4. Protection: Padding and filler strips

E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

G. Backing: concealed backing to comply with local codes and as required for substrate conditions; or manufacturers standard mounting kits.

2.3 FINISHING

A. Stainless Steel: No. 4 satin brushed, typical on all accessories, unless otherwise noted.

B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats vitreous enamel.

C. Chrome/Nickel Plating: satin finish.

D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 - EXECUTION

3.1 MOUNTING LOCATIONS

A. Comply with ADA and TAS requirements. Refer to drawings. When not shown, submit supplier's recommendations for locations and mounting height before proceeding.

B. Contractor shall be responsible for supplying all opening, blocking, and other components necessary for installation of all toilet accessories.

C. Use approved theft-resistant type fasteners.

3.2 SCHEDULE

A. As a quality standard, Model Numbers shown which are not Owner furnished are products of Bobrick Washroom Equipment, Inc.

<u>WASHROOM EQUIPMENT</u>
1. TA-1 - Soap Dispensers:
   a. Mounting: Surface.
   b. Model No.: B-2112.
   c. Locations: One (1) at each lavatory. Refer to drawings.

2. TA-2 - Mirrors:
   a. Mounting: Surface.
   b. Model No.: B-290.
   c. Size/Locations: 24 inches x 36 inches, unless shown otherwise. One (1) at each lavatory. Refer to drawings.
3. TA-3 - Toilet Paper Dispenser:
   a. Mounting: Surface.
   b. Model No.: B-265.
   c. Locations: One (1) at each water closet. Refer to drawings.
4. TA-4 - Paper Towel Dispenser:
   a. Model No.: B-262
   b. Locations: Refer to drawings.
5. TA-5 - Grab Bars: (At Typical Accessible Toilet Stalls)
   a. Size/Finish: 1-1/2 inch diameter Satin Finish Stainless Steel.
   b. Clearance: 1-1/2 inch between rail and wall.
   c. Model No.: B-6806.
   d. Mounting: Attach with concealed mounting. Mount parallel to floor.
   e. Location: One (1) 36 inch behind toilet, and one (1) 42 inch long bar at side of toilet, at each accessible stall. Refer to drawings.
6. TA-6 - Sanitary Napkin Dispenser:
   a. Mounting: Surface
   b. Model No.: B-2706
   c. Operation: Single coin / Double coin - (25/50 cents)
   d. Capacity: 20 Napkins/ 30 Tampons
   e. Locations: One (1) at each Women's toilet room. Refer to drawings.
7. TA-7 - Sanitary Napkin Disposal:
   a. Mounting: Surface
   b. Model No.: B-270
   c. Locations: One (1) at each Women's toilet room. Refer to drawings.
8. TA-8 Mop and Broom Holder:
   a. Mounting: Surface
   b. Model No.: B-239 x 34
   c. Capacity: Four (4) hooks, three (3) mop holders.
   d. Location: One (1) above mop sink at each custodial room whether indicated or not. Refer to drawings.
9. TA-9 - Grab Bars: (At Accessible Shower)
   a. Mounting: Surface
   b. Model: B-6861 modified (24 x 16)
   c. Location: One (1) at each accessible shower stall. Refer to drawings.
10. TA-10 - Folding Bench:
    a. Mounting: Surface, reversible.
    b. Models: B-5181
    c. Location: One (1) at each accessible shower stall.
11. TA-11 - Clothes Hook:
    a. Mounting: Surface
    b. Model No.: B-6717; or equivalent.
    c. Location: One (1) hook inside door at single toilet rooms, and one (1) hook at each shower location if not included in partition package described below, unless noted otherwise.
    d. Toilet and Shower Partitions: hook provided by toilet partition manufacturer included in standard hardware package in accordance with Section 10 21 13.19 – Toilet and Shower Partitions; unless noted otherwise.
12. TA-12 - Shower Curtains, Rods and Hooks:
    a. Model Nos.:

1) Rods: B-6047 (36 inches or as indicated)
2) Curtains: 204-2 (42 inches x 72 inches or as required)
3) Hooks: 204-1 (Seven (7) hooks per curtain or as required)
4) Mounting/Location: One (1) at each accessible shower. Refer to drawings.

13. TA-13 - Electric Hand Dryer
    a. Mounting: Semi-recessed, maximum 3-9/16 inch recess
    b. Model No.: B-750, White
    c. Voltage: 120 volt, single phase.
    d. Location: Refer to drawings.
14. TA-14 - Paper Towel Dispenser / Trash Receptacle Combination
    a. Mounting: Surface
    b. Model No.: B-3949
    c. Locations: Refer to drawings.
15. TA-15 - Grab Bars: (At Additional Accessible Toilet Stalls)
    a. Size/Finish: 1-1/2 inch diameter Satin Finish Stainless Steel.
    b. Clearance: 1-1/2 inch between rail and wall.
    c. Model No.: B-6806.
    d. Mounting: Attach with concealed mounting. Mount parallel to floor.
    e. Location: One (1) 36 inch at each side of toilet, at each accessible stall. Refer to drawings.
16. TA-16 - Diaper Changing Stations:
    a. Type: Horizontal station to accommodate infants and toddlers.
    b. Construction and Features:
        1) FDA approved injection-molded polypropylene with steel-on-steel hinge system. Fabricate to withstands static loads over 400 pounds.
        2. Child protection straps with snap-lock fasteners.
        3) Built in diaper bag hooks.
        4) Built-in sanitary liner dispensers. Liners shall be 3-ply, biodegradable.
        5) Premium gas spring mechanism.
        6. Molded usage and safety instructions in six (6) languages and Braille.
        7) ADA compatible.
        8) Anti-fungal to comply with ASTM standards.
    c. Color: As selected by Architect.
    d. Dimensions: 35 inches long by 22 inches high by 4 inches deep.
    e. Quantity: Six (6) Total
    f. Approved Product/Manufacturer: Koala Bear Kare Baby Changing Stations, Model KB 200, as manufactured by Koala Bear Kare®, Englewood, CO; (888) - 733-3456, or Architect approved equal.
17. TA-17 - Trash Receptacle
    a. Mounting: Recessed
    b. Model No.: B3644.
    c. Locations: Refer to drawings.

END OF SECTION

SECTION 10 44 13

FIRE PROTECTION CABINETS AND EXTINGUISHERS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Fire Extinguishers

B. Cabinets

1.2 REFERENCES

A. NFPA 10 – Portable Fire Extinguishers

B. ADA Accessibility Guidelines

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Provide fire extinguisher, cabinets and accessories by single manufacturer.

1.4 SUBMITTALS

A. Product Data:
   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
   2. Manufacturer's installation instructions.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Specifications are based on the products of named manufacturers. Other listed manufacturers who produce products equivalent to those specified are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent to those specified and comply with Division 1 requirements regarding substitutions to be considered.
   1. Larsen's Manufacturing Co.
   2. The Williams Bros. Corporation of America
   3. J. L. Industries, Inc.
   4. Potter-Roemer

2.2 MATERIALS

A. Fire Extinguisher Cabinets (FEC):
1. Size: 24 inches x 9-1/2 inches x 6 inches inside box dimensions.
2. Type: Semi-recessed with 2-1/2 inch return trim rolled edge; ADA compliant.
3. Tub Construction: 22 gauge min. steel with standard baked acrylic enamel interior finish.
4. Door and Frame: 18 gauge min. 304 stainless steel door and frame with vertical decal lettering "FIRE EXTINGUISHER" in red color, unless directed otherwise by Architect.
5. Glazing: Clear acrylic “Duo” vertical glazing panel
6. Hardware: Continuous concealed piano hinge constructed of material which matches door and trim material. Satin finish pull handle with cam cylinder lock with safety pull designed to release upon firm pull on handle (Larsen’s “Larsen-Loc”™, J.L. Industries “Saf-T-Lok”™; or equivalent)
7. Bracket: Hook type; Larsen’s #1007, or equal.
8. Finish of Exterior: #4 stainless steel.
9. Fire-Rated Cabinets: As occurs, provide fire-rated cabinet for one- or two-hour rated conditions as indicated or required by specific location. Cabinet shall be tested and approved by Warnock Hersey to ASTM E-814, and shall bear the Warnock Hersey label.

B. Fire Extinguisher Cabinets:
1. Larsen’s Manufacturing FB3612-RL with “FIRE EXTINGUISHER” (vertical) and “FIRE BLANKET” (horizontal) lettering furnished with 62” x 80” fire blanket complying with federal specification #CS-191-53.

C. Fire Extinguishers:
1. Models/Types:
a. Multipurpose dry chemical with 10 lbs. capacity, UL Listed, 4A:80B:C rating conforming to MP10 Series.
b. Wet chemical with 2.5 gallon capacity and UL 2A:K rating.
2. Mounting: Provide eye brackets for direct wall mounting to hook and for mounting in Fire Extinguisher cabinets.
3. Quantity: (7) Seven Total.
3. Provide initial inspection tag for each extinguisher.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fire protection cabinets in locations or required by authorities having jurisdiction and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

C. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged fire extinguishers.
2. Install fire extinguishers in compliance with requirements of authorities having jurisdiction.

3.2 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 10 50 90

METAL LOCKERS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 03 30 00 - Cast-In-Place Concrete

B. Section 06 10 00 - Rough Carpentry

C. Section 09 65 19 - Resilient Tile Flooring and Base: Rubber base.

D. All Sections of work to which lockers are attached.

1.2 SUBMITTALS

A. Product Data:
1. Manufacturer's schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.
2. Manufacturer's installation instructions.

B. Shop Drawings: Indicate size, material, and finish. Show location and installation procedures. Include details of joints, attachments and clearances.

C. Samples or color charts showing manufacturer's full range of colors.

D. Locker/Lock Schedule: Manufacturer shall furnish the Owner upon Substantial Completion a schedule for all lockers. The schedule shall contain the locker number, serial number of the lock installed, key number, or combinations, as applicable, for each locker. Furnish the schedule in spread sheet form, i.e. Excel, Lotus, etc., as directed by the Owner. Furnish schedule in three (3) hard copies and on either CD or floppy disc media as directed by the Owner.

1.3 WARRANTY

A. Warrant the work specified herein against defects in material and workmanship to the original purchaser for the life of the product.

B. Defects shall include, but not be limited to, the following:
1. Rapid deterioration of finish.
2. Loose or missing parts.
3. Non-functioning components and mechanisms.
4. Rust, delamination, warp, rot or breakage.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five-(5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

1. DeBourgh Manufacturing Co., LaJunta, CO; (800) 328-8829
2. General Storage Systems, Austin, TX; (512) 289-0090 (“Eclipse”/”Mod-U-Vent”)
3. List Industries, Inc. Deerfield Beach, FL; (800) 776-1342
4. Lyon Metal Products, Inc., Aurora, IL; (800) 545-5752
5. Penco Products, Inc., Oaks, PA; (800) 562-1000
6. Republic Storage Systems Co., Inc., Canton, OH; (800) 477-1255

2.2 MATERIALS AND FABRICATION

A. All-Welded Lockers:
1. Material: Prime, high grade Class l mild annealed, cold-rolled steel.
2. General Construction: Pre-assembled, welded seams and joints. Bolts, screws or rivets used in the assembly of the locker bodies are not permitted. Welds shall be free of burrs.
3. Body: 16 gauge, flanged.
4. Backs: 18 gauge, one-piece
5. Door Frame: 16 gauge, channels or angles, with continuous door strike. Multiple tiered assemblies shall have intermediate cross frame welded to vertical framing members.
6. Door: 14 gauge formed door constructed of single piece cold rolled steel. Full channel shaped on lock side, formed channel formation on hinge side, right angle shaped on horizontal sides.
7. Ventilation: Six (6) louvers per door, top and bottom, minimum 7 percent ventilation.
8. Hinges: Two (2) inches high minimum, five (5) knuckle, full loop, tight pin. Weld to door and frame. Two (2) per door for lockers 42 inches high or less; three (3) per door for lockers over 42 inches high.
9. Latching: one-piece, pre-lubricated spring steel, completely contained within the lock bar under tension to provide rattle-free operation. Provide three (3) latching points for lockers over 42 inches in height and two (2) latching points on for all tiered lockers 42 inches and under in height.
10. Pre-Locking Device: Lockers shall be equipped with a positive automatic pre-locking device whereby the locker may be locked while the door is open and then closed without unlocking and without damaging the locking mechanism.
11. Handles: Recessed, stainless steel with non-protruding lifting trigger.
12. Number Plates: Aluminum with etched figures at least 3/8 inches high, attached near top of door with two (2) aluminum rivets. Number plates shall be in order as directed by the Architect.
13. Finish: Baked enamel. Colors shall be as selected by Architect from manufacturer's standard colors. Lockers shall be painted inside and outside with the same color.
14. Fasteners/Anchors: Provide fasteners and anchors of type, size and finish as recommended by manufacturer for attaching or anchoring lockers to walls and floor.
15. Free-Standing Lockers: Provide front and end closed bases.
16. Base: Lockers shall rest on bases as detailed on drawings.
17. Locks: Master #1630 Built-In Combination Locks (Spring Bolt Action) for right-hinged doors with five (5) Master / Control keys. Furnish locker/lock schedule as specified in Paragraph 1.2, D above.
18. Top Closures, Closure Strips, and Fillers: Provide where shown, factory fabricated and finished to match lockers, unless noted otherwise.

B. A. D. A. Compliant Lockers: Handicap lockers shall have recessed handles and shall be single tier or the lower opening of a double tier locker. Locker bottom shall be a minimum of 15 inches off the floor, or an extra shelf placed 15 inches off the floor with bottom or shelf turned down to close resultant opening. Provide one (1) ADA compliant locker.

2.3 LOCKER TYPES

A. Type 'A' Athletic Lockers: 15 inches wide by 15 inches deep by 36 inches high, double tier for a total of 72" high with interior hooks, louvered door, solid back, dividers, ends, fillers, sloped tops, and four (4) inch high concrete base. Colors shall be as selected by Architect from manufacturer's standard colors.

2.3 LOCKER ROOM BENCHES

A. Materials:
   1. Benches: Provide manufacturer's standard laminated maple hardwood tops 9-1/2 inches wide by 1-1/4 inch thick, with one coat penetrating sealer and two coats hot applied lacquer or gloss polyurethane, in lengths as indicated, one piece up to 12 feet.
   2. Pedestals: Provide Penco Products, Inc. heavy duty freestanding stainless steel pedestal or equivalent by listed manufacturer through bolted to the top with carriage bolts. Provide two pedestals for 4'-0" and 6'-0" long benches and three pedestals for 8'-0" long benches.
   3. Anchorages: Furnish all anchorages required for a secure installation.
   4. Finish: Apply manufacturer's standard baked enamel finish to painted items in manufacturer's standard neutral color.

2.4 OTHER MATERIALS:

A. Provide other materials, not specifically described but required for a complete and proper locker installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble and install lockers plumb, level, and flush in the locations shown on the drawings in accordance with the manufacturer's instructions. Lockers shall have no sharp metal edges.

B. Install and anchor lockers to the floor and wall as instructed by the manufacturer.

C. Install sloping hoods, metal fillers, end panels and trim to close openings, and accessories where shown on drawings or required to complete installation. Install using concealed fasteners. Provide flush hairline joints against adjacent surfaces.

D. Ensure number plates are installed in order directed by the Architect.

3.2 ADJUST AND CLEAN

A. Adjust doors and latches to operate without binding and positive latching and automatic locking.

B. Touch up marred finishes on lockers with manufacturer's supplied paint.

END OF SECTION

SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 GENERAL

1.1 SUMMARY

A. Section includes horizontal louver blinds at all exterior windows in classrooms, offices, conference rooms, workrooms and any other window scheduled on the Drawings to receive blinds.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00, Rough Carpentry.

B. Section 08 80 00, Glazing.

1.3 SUBMITTALS

A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer's installation instructions.

B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

C. Samples or color charts showing manufacturer's full range of standard colors for Architect’s selection.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTY

A. Warrant the work specified herein for lifetime, without charge to the original purchaser, any part found defective in workmanship or material as long as the blind remains in the same window for which it was purchased.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Specifications are based on "Riviera Contract 1 inch Blind" manufactured by Levelor Home Fashions Contract Division; (800) 826-8021. Manufacturer's listed who produce equivalent products to those specified are approved for use on this Project. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions to be considered.
   1. Springs Window Fashions Division, Inc., (Bali Classics); (800) 544-4749
   2. Hunter Douglas, Inc.; (800) 727-8953

2.2 MATERIALS

A. Horizontal blinds shall consist of the following:
   1. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
      a. Width: Nominally 1 inch wide.
      b. Thickness: Nominally .006 inch.
   2. Headrail: Formed steel; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
   3. Manual Lift Mechanism:
      a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
      b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
   4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
      a. Tilt: Full.
      b. Operator: Clear plastic wand, multi-sided cross-section measuring approximately 5/16 inch across flats. Wand shall be easily detachable by means of a wand link and sliding sleeve.
      c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
   5. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
   6. Manual Lift-Operator and Tilt-Operator Locations: Right side and left side of headrail, respectively.
   7. Bottom Rail: Formed-steel that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
   8. Lift Cords: Manufacturer's standard braided cord of sufficient length equalized to properly control raising and lowering of blind and spaced not over 46 inches between cords.
   9. Ladders: Braided cord evenly spaced across headrail at spacing that prevents long-term slat sag. Distance between end ladder and end of slats shall not exceed six inches.
   10. Valance: Two slats.
   11. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
      a. Type: End support with reinforcing ribs and field adjustable tabs to ensure secure installation, center blind in window, and to prevent lateral movement.
      b. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
   12. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard where required to prevent blinds from swaying from air movement or for blinds used on doors.

13. Colors, Textures, Patterns, and Gloss:
    a. Slats: Color similar to Levelor “Almond” #137 or as selected by Architect from manufacturer’s full range.
    b. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
    1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
    1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
    1. Coordinate requirements for distance between blinds and glass to comply with requirements in GANA’s “Glazing Manual” to avoid heat buildup and possible damage to glass.

B. Install mounting and intermediate brackets to prevent deflection of headrails.

C. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

D. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.2 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION

SECTION 13 34 19

PRE-ENGINEERED METAL BUILDING SYSTEM

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pre-engineered building as indicated on the drawings and specified herein.

B. Include all components and parts of the building (consisting of primary structural steel framing, purlins, girts, necessary bracing, struts and connecting members), roof panels, wall panels, roof liner panels, louvers, and flashing curbs, gutters and downspouts, all with necessary closures and fasteners.

1.2 GENERAL REQUIREMENTS

A. Cooperation by Contractor for Work of this Section with all other trades is mandatory, so that all phases of work may be properly coordinated without delays or damage to any parts of any work.

B. The Contractor shall provide all items, articles, materials, operations, or methods listed, mentioned or scheduled on the drawings and/or herein, including all labor, material, equipment and incidentals necessary and required for their completion.

1.3 RELATED SECTIONS

A. Section 03 30 00 - Cast-In-Place Concrete: Foundations and anchor bolts.

B. Section 09 91 00 - Painting and Staining

1.4 REFERENCES

A. ASTM International (ASTM)
1. A3, Standard Specification for Steel Joint Bars, Low, Medium, and High Carbon (Non-Heat-Treated)
2. A36, Standard Specification for Carbon Structural Steel
3. A307, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
4. A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
5. A529, Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
6. A570, Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
7. A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steel
8. A607, Standard Specification for Steel, Sheet and Strip, High-Strength Low-Alloy Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled
9. A653, Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated Galvanealed) by the Hot-Dip Process
10. A792, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
11. E1592, Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

12. E1646, Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
13. E1680, Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems

B. American Welding Society (AWS)
1. D1.1, “Structural Welding Code”

C. Underwriters’ Laboratories, Inc. (UL)
1. Tests for Uplift Resistance of Roof Assemblies
2. Tests for Impact Resistance of Roofing Materials

1.5 QUALITY ASSURANCE

A. Where standards or requirements of this Section are in conflict with those noted on the Contract Drawings, or the Building Code, the more stringent requirements shall govern. Bring all conflicts and discrepancies to the attention of the Architect and do not start work until such conflicts and discrepancies are clarified and corrected. Failure to do so will not relieve the Contractor from performing the Work correctly at no additional expense to the Owner.

1.6 BUILDING NOMENCLATURE

A. The building “Width” and “Length” shall be measured from outside to outside face of wall covering.

B. The building “Eave Height” shall be measured from the bottom of the base plate of the rigid frame columns to the intersection of lines representing the inside of the wall covering and the inside of the roof covering.

C. The “Roof Slope” shall be as indicated on the drawings.

D. The “Bay Spacing” between frame center lines shall be as shown on drawings.

1.7 DESIGN AND LOADS

A. All structural steel sections and welded plate members shall be designed in accordance with the AISC, “Specifications for Design, Fabrication, and erection of Steel for Buildings.”

B. All cold formed structural members and exterior covering shall be designed in accordance with the AISI, “Specification for the Design of Cold-Formed Steel Structural Members”.

C. Design Loads:
1. Basic design loads, as well as collateral loads shall be as specified.
   a. Basic design loads in addition to dead load; include live load, and wind load.
   b. Collateral loads include dead loads over and above weight of pre-engineered metal building system, such as mechanical systems and ceiling systems. Insulation weight is considered part of pre-engineered metal building system.
   c. Design each member to withstand stresses resulting from combinations of loads that produce maximum stresses in that member.
2. Roof Live Load:
   a. 0 - 200 square feet - tributary area: 20 psf.
   b. 201 - 600 square feet - tributary area: 16 psf.
   c. 601 square feet or greater - tributary area: 12 psf.

d. Roof Covering: 20 psf or 200 pounds concentrated load located at center of maximum roof panel span.

3. Dead Load: Withstand weight of pre-engineered metal building system, minimum 25 psf.
4. Collateral Load: Five (5) PSF collateral dead load is the additional dead load that the structure needs to support over and above the weight of the roof deck and other structural components.
5. Thermal Load: Withstand movement caused by ambient temperature range of 120 degrees F and surface temperature range of 160 degrees F.
6. Special Loads: Provide support beams in addition to roof purlins to support loads greater than 500 pounds.

D. Wind Design:
1. For design of primary members, as well as wall and roof elements and components, calculate wind pressures in accordance with International Building Code (IBC), Chapter 16. As a minimum, use wind speed of 120 MPH, Exposure B.
2. Wind pressures will not be arbitrarily reduced for purposes of calculating column base reactions. Allowable stresses for anchor bolt design may be increased in accordance with Building Code.
3. Masonry Wall Supports: Provide girts as detailed on top of exterior masonry walls, designed to resist lateral wind load on masonry walls. Maximum allowable deflection of girts: L/360.
4. Wind Uplift Rating: UL Class 90 wind uplift rating in accordance with UL 580.

E. Primary Frame Lateral Drift:
1. Wind pressures for purposes of calculating lateral drift of primary frames shall be based on 50 year mean recurrence interval using scheduled wind speed.
2. Lateral Drift Calculation:
a. Assume frames are pinned-base with no partial base fixity.
b. Consider frames as “bare’ frames, with no additional stiffness provided by roof.
c. Load sharing between frames is not permitted.
3. Lateral Drift Limit: Eave height h/360 where connected to masonry and h/180 where no masonry exists.

F. Design Load Combinations: Loading combinations of dead load (DL) + live load (LL), + wind load (WL).

G. Anchor Bolts: Furnish design criteria for anchor bolts furnished by others, to resist the loads induced by the design loads on the structure.

1.8 ROOF PANEL SYSTEM PERFORMANCE TESTING

A. Panel system shall have a UL 2218, Class 4 Impact Resistance Rating.

B. Metal roof system must be tested in accordance with UL Test Method 580, Tests for Uplift Resistance of Roof Assemblies.

C. Resist the roof design pressures calculated in accordance with UBC or authorities having jurisdiction. Determine panel bending and clip-to-clip strength by testing in accordance with ASTM E1592. Capacity for gauge, span or loading other than those tested may be determined by interpolating test results.

D. Metal roof system must meet the air infiltration requirements of ASTM E1680 when tested with a 6.24 PSF pressure differential with resulting air infiltration of 0.0071 cfm/sq. ft.

E. Metal roof system must meet the water penetration requirements of ASTM E1646 when tested with a 12.00 PSF pressure differential with no uncontrollable water leakage when five (5) gallons per hour of water is sprayed per square foot of roof area.

1.9 SUBMITTALS

A. Design Data: Provide detailed design criteria and calculations.

B. Structural Engineer Certification: Letter signed by a Professional/Structural Engineer, registered to practice in the jurisdiction of the project, verifying compliance with Contract Documents and Manufacturer's Standard Design Requirements. Letter shall reference specific dead loads, live loads, wind loads, tributary area load reductions (if applicable) collateral loads, seismic loads, end use categories, and governing building code including edition and load applications.

C. Shop Drawings: Show building layout, primary and secondary framing member sizes and locations, cross-sections, and product and connection details.

D. Product Data: Information on manufactured products to be incorporated into the project.

E. Color Charts: For selection of colors.

F. Anchor Bolt Installation Drawings: Layouts with bolt diameters.

G. Warranty: Specimen of manufacturer's warranty.

1.10 INSPECTION

A. Architect, Owner, and General Contractor reserve the right to inspect the work during fabrication. Upon completion of the work, if inspection discloses that materials are not in accordance with specifications or has been damaged, Manufacturer/Fabricator agrees to furnish additional materials necessary to make repairs and place work in an acceptable condition.

1.11 WARRANTY

A. Warrant the work specified herein against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials or workmanship. Warranty shall be a "Weather tightness" Warranty. Field Reports are required throughout Project and are to be supplied by a Manufacturer's Approved Technical Inspector. Manufacturer's personnel which are not Quality Control Technicians are not acceptable for inspection.
   1. Roof Panels and Finish:
      a. Durability of the roof panels due to rupture, structural failure or perforation shall be warranted for a period of 20 years by the Manufacturer.
      b. The exterior color finish for painted roof panels shall be warranted by the Manufacturer for 20 years against chalking, blistering, peeling, cracking, flaking, checking and chipping.
   2. Weathertightness:
      a. The entire roof system including all roof panels, flashings, curbs, interior gutters, etc. shall be warranted by the manufacturer against leaks for a period of 20 years.
      b. The warranty shall be issued to the Owner by the Manufacturer at time of entire Project Substantial Completion.
      c. The warranty shall guarantee the entire roof system and associated work against defective materials and workmanship of installation.

d. The roof system shall include roof insulation, flashing, metal work, labor, and material shall be guaranteed against failure of workmanship and materials. Repair of the system by the manufacturer, including materials and labor, shall be done at no cost to the Owner.

3. Roofing Contractor: Jointly with any subcontractors employed by him, shall guarantee the work required and performed under this contract will be free from defects in workmanship and materials, and that the building will be and remain waterproof for a five (5) year warranty period, after the Architect accepts the work as substantially complete. The warranty shall be in approved notarized written form, to obligate the Contractor, and subcontractors, to make good the requirements of the warranty.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Specifications are based on products listed below as "Basis of Specification", except where specified otherwise. Manufacturers named below whose product meets or exceeds the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

1. Pre-engineered Metal Building System:
   a. Alliance Steel, Inc.; Oklahoma City, OK (800) 624-1579
   b. American Steel Building, Inc.; Houston, TX; (800) 877-8335
   c. Butler Manufacturing Company, Kansas City, MO; (816) 968-3304
   d. NCI Building Systems LP, Houston, TX; (800) 777-9378 (Basis of Specification)
   e. Rigid Structures, Houston, TX: (281) 443-9065
   f. Robert S. Henry Company, Houston, TX (866) 717-2185
   g. Titans Steel Structures, Inc. Houston, TX; (281) 679-6712
   h. United Structures of America, Houston, TX; (281) 442-8247
2. Metal Roof, Wall, and Roof Liner Panels:
   a. MBCI, Houston, TX; (877) 713-6224 (Basis of Specification)
   b. Architect approved equal from Metal Building Manufacturer

2.2 METAL MATERIALS

A. Select materials and material yield strengths based on building design requirements; use the following unless required otherwise.

1. Structural Steel Plate, Bar, Sheet, and Strip for Use in Bolted and Welded Constructions: ASTM A572, A570, A529, or A36, with minimum yield strength of 50,000 psi.
2. Structural Steel Material for Use in Roll Formed or Press Broken Secondary Structural Members: ASTM A570, or A607 with minimum yield strength of 55,000 psi.
3. Galvanized Steel Sheet for Roll Formed or Press Broken Roof and Wall Coverings, Trim and Flashing: ASTM A653, with minimum yield strength of 50,000 psi.
4. Galvalume Steel Sheet Used in Roll Formed or Press Broken Roof Covering: Aluminum-zinc alloy-coated steel sheet, ASTM A792, with minimum yield strength of 50,000 psi; nominal coating weight of 0.5 oz. per sq. ft. both sides, equivalent to an approximate coating thickness of 0.0018 inch both sides.
5. Hot Rolled Steel Shapes: W, M and S shapes, angles, rods, channels and other shapes; ASTM A572, or ASTM A3 as applicable; with minimum yield strengths required for the design.

6. Structural Bolts and Nuts Used with Primary Framing: High strength, ASTM A325.
7. Bolts and Nuts Used with Secondary Framing Members: ASTM A307.

B. Finish:
1. Sheltered and Interior Primary Structural Members: Manufacturer's standard rust-inhibitive primer paint; manufacturer's standard color.
2. Weather Exposed Primary Structural Members: Hot-dipped galvanized; G-60
3. Secondary cold-rolled Framing: Pre-galvanized; G-90

C. Pre-Painted Finish: 1 mil PVDF Kynar 500 or Hylar 5000 coating as selected by Architect from manufacturer's full line.

2.3 FRAMING COMPONENTS

A. Primary Framing: Rigid Frame (RF Series) solid web framing consisting of tapered or uniform depth rafters rigidly connected to straight uniform depth columns (no tapered columns allowed). Provide a clear span that supports the loads at bay spacing indicated.

B. Endwall Framing: Corner posts, endposts and rake beams.

C. Purlins: Zee-shaped; depth as required; with minimum yield strength of 55,000 psi; simple span or continuous span as required for design.

D. Girts: Zee- or Cee-shaped; depth as required, with minimum yield strength of 55,000 psi; simple span or continuous span as required for design.

E. Transbay Members: Open web, parallel chord, secondary joists; simple span, utilizing materials, sizes and yield strength as required.

F. Wind Bracing: Portal, torsional, diagonal bracing or diaphragm in accordance with manufacturer's standard design practices; utilizing rods, angles, and other members, with minimum yield strengths as required for design.

G. Primary Frame Flange Bracing: Attached from purlins or girts to the primary framing, minimum yield strength as required for design.

H. Base Angles: 2 inch by 3 inch by 0.059 inch steel angles, with minimum yield strength of 55,000 psi, anchored to the floor slab or grade beam with power driven fasteners or equivalent at a maximum spacing of 2 feet on center and not more than six (6) inches from the end of any angle member.

I. Sag Angles and Bridging: Steel angles, with minimum yield strength of 36,000 psi.

J. Fabrication: Fabricate according to manufacturer's standard practice.
1. Fabricate structural members made of welded plate sections by jointing the flanges and webs by continuous automatic submerged arc welding process.
2. All welding operators and processes shall be qualified in accordance with AWS D1.1.
3. Field connections. Prepare members for bolted field connections by making punched, drilled, or reamed holes in the shop.

K. Component Identification: Mark all fabricated parts, either individually or by lot or group, using an identification marking corresponding to the marking shown on the shop drawings, using a method that remains visible after shop painting.

L. Shop Coating: Finish enclosed structural steel members using one (1) coat of manufacturer's standard shop coat, after cleaning of oil, dirt, loose scale and foreign matter.

M. Package building components for shipping by common carrier.

2.4 ROOF AND WALL PANEL COMPONENTS

A. Metal Roof Panels:
1. Panel Profile: Two (2) inch high by 3/4 inch wide rib by 16 inch wide, striated panel.
2. Metal Roof System: Vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations, with factory applied hot-melt mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.
3. Gauge: Minimum 24 gauge (UL 90 rated)
4. Substrate: Galvalume® steel sheet, Grade “D” minimum yield of 50,000 PSI.
5. Clips: Two (2) piece floating clip, 18 gauge base, 24 gauge top, with factory applied mastic, with two (2) fasteners to structural. Comply with FM 1-90 requirements.
6. Texture: Striations.
7. Finish: Premium fluorocarbon coating produced with Kynar 500® or Hylar 5000® resin (20 year warranty) in color selected by Architect from manufacturer's available colors.
8. Touch-up Paint: ZRC Cold Galvanizing Compound manufactured by ZRC Chemical Products, Quincy, MA; Galvax Zinc-rich Cold Galvanizing Coating manufactured by Alvin Products, Inc., Lawerence, MA; or paint complying with military specification MILP-21035A, Type I or II.
9. Approved Product/Manufacturer **SuperLok®** architectural structural standing seam metal roof system manufactured by MBCI, Houston, TX; (281) 445-8555, or Architect approved equal.

B. Metal Wall Panels:
1. Panel Profile: One (1) inch high by 12 inch wide, flush face panel.
2. Gauge: 24 gauge
3. Substrate: Galvalume Plus® steel sheet, Grade “D” minimum yield of 50,000 PSI.
4. Texture: Striations.
5. Finish: Premium fluorocarbon coating produced with Kynar 500® or Hylar 5000® resin (20 year warranty) in color selected by Architect from manufacturer's available colors.
6. Approved Product/Manufacturer: **Designer Series** Metal Wall Panel manufactured by MBCI, Houston, TX, or Architect approved equal.

C. Roof Liner Panels:
1. Panel Profile: 3/4 inch high rib spaced 6 inches on center x 36 inch wide coverage per panel, with perforated holes covering 23 percent of surface area, and shall run from eave to ridge in one continuous length.
2. Gauge: 29 gauge
3. Substrate: Galvalume Plus® steel sheet, Grade “D” minimum yield of 50,000 PSI.
4. Trim: Same gauge and color as panel (Polar White)
5. Finish: Manufacturer’s Signature 200® Siliconized Polyester coating (20 year warranty) in Polar White color or as selected by Architect from manufacturer's available colors.
6. Approved Product/Manufacturer: **“D” Panel®** Architectural Metal Wall Panel manufactured by MBCI, Houston, TX, or Architect approved equal.

D. Panel Fasteners: "Long Life" carbon steel zinc-aluminum ("ZAC") hex head complete with integrated metal and neoprene sealing washer. Color of exposed fastener heads to match the panel finish. Fastener type shall not void warranty of panel finish.
   1. Standard fasteners for attachment of roof and wall panels to secondary framing members, attachment to adjoining panels, and attachment of trim to the panels: Self-drilling type, of size required by the manufacturer.
   2. Provide fasteners in quantities and location as required by the manufacturer.
   3. Fasteners at roof liner panels shall have a #12 x 3/4 self-driller spaced 6 inches on center attaching panel to bottom of purlin. The side lap of each panel shall have a #14 x 7/8 lap Tek 20 inches on center the full length of the panel.
   4. Fasteners for trim splices: 1/8 inch by 3/16 inch stainless steel blind rivet. Head shall be color coated to match trim colors.

E. Flashing and Trim: Match material and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.

F. Sealants, Mastics and Closures: Manufacturer's standard type.
   1. Provide at roof panel endlaps, sidelaps, rake, eave, transitions and accessories as required to provide a weather resistant roof system; use tape mastic or gunnable sealant at sidelaps and endlaps.
   2. Provide at wall panel rakes, eaves, transitions and accessories.
   3. Closures: Formed to match panel profiles; closed cell elastic material, manufacturer's standard color.
   4. Tape Mastic: Pre-formed butyl rubber-based, non-hardening, non-corrosive to metal; white or light gray.
   5. Gunnable Sealant: Non-skinning synthetic elastomer based material; gray or bronze.

2.5 ROOF ACCESSORIES

A. Eave Gutters: Roll-formed 26 gauge steel sheet in 10 foot or longest practical length, with gutter straps, fasteners and joint sealant. Snap-on gutter straps shall be provided for ease in erection at a maximum spacing of 5 feet-0 inches. Design of the gutter will permit rapid installation or removal after roof and wall sheets are in place. Gutter shall screen the eave ends of roof sheets from view. No portion of the gutter will protrude under the roof panels. Color shall be as selected by Architect from manufacturer's full line.

B. Vents: Ridge vent, and/or low profile ridge ventilator as shown on Drawings.

C. Gravity ridge ventilators shall be manufactured from galvanized steel and painted white. The ventilator body shall be 26 gauge and the skirt shall match the roof slope. Chain operated damper will be furnished when shown or required. Ventilators shall be equipped with standard bird screens and riveted end caps. Ventilators shall be ten (10) feet long and have a nine (9) inch or 12 inch throat where shown or required.

D. Downspouts: Shall be 26 gauge steel sheet in 10 foot or longest practical length, rectangular shaped. Downspouts shall have a 45 degree elbow at the bottom and shall be supported by attachment to the wall covering at 10 feet maximum spacing. Color shall be same as wall panels.

2.6 WALL LOUVERS

A. Type: Metal drainable compatible with metal wall panels as recommended by the wall panel manufacturer to suit application.

B. Number/Dimensions/Locations: As shown on drawings.

C. Finish: Premium fluorocarbon coating produced with Kynar 500® or Hylar 5000® resin (20 year warranty) in color selected by Architect from manufacturer's available colors.

2.7 ROOF INSULATION SYSTEM - CONDITIONED SPACE

A. Batt or Roll Thermal Insulation:
1. Type: ASTM C665, Type 1
2. R-Values (minimum): R-32, total
3. Surface Burning Characteristics:
   a. Flame Spread: 25 or less
   b. Smoke Developed: 50 or less
4. Size/Thickness: 8 inch (R-19) vinyl faced over purlin, plus 6 inch (R-13) unfaced in insulation cavity; unless indicated otherwise on drawings. Vinyl side towards attic/plenum space.
5. Approved Manufacturers/Products:
   a. CertainTeed Corp. (AcoustaTherm)
   b. Guardian Fiberglass, Inc.(Thermal Control Batts)
   c. Johns-Manville (Thermal-SHIELD Thermal Insulation)
   d. Knauf (Thermal Batt Insulation)
   e. Owens-Corning (Thermal Batt Insulation)

B. Vapor Barrier Facing:
1. Shall be either a vinyl film (3.2 mil thickness) or vinyl reinforced polyester (VRP) film (3 mil approximate thickness). Vinyl reinforced polyester facing is recommended when air temperatures of 30 degrees F or below are anticipated during shipment or erection.
2. Shall have an Underwriters' Laboratories flame spread rate of 25 or less and a smoke developed rating of 50 or less.
3. Shall have a water vapor transmission value of 1.00 perms for vinyl film facing and 0.02 perms for VRP facing.
4. Color: Shall be white.
5. Width: Shall be 78 inches so as to provide a 3-inch tab projecting beyond each side of the fiberglass blanket.

C. Provide thermal break on top of purlin to separate structural steel and girders from aluminum roof panels.

2.8 ROOF INSULATION SYSTEM - UNCONDITIONED SPACE

A. Batt or Roll Thermal Insulation:
1. Blanket Insulation: ASTM C 665, Type II, Class C, Kraft Faced Fiberglass Blanket.
2. Thermal Resistance: 6 inch, R-19
3. Physical Properties:
   1. Water Vapor Transmission, ASTM E 96, 1.00 Perm (57.45 ng/(Pa*s*m²) or less.
4. Approved Manufacturers:
   a. CertainTeed Corp.
   b. Guardian Fiberglass, Inc.
   c. Johns-Manville
   d. Knauf
   e. Owens-Corning

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that foundations are installed correctly.

B. Verify that anchor bolts are installed as indicated on anchor bolt shop drawings.

3.2 ERECTION

A. Provide temporary bracing, shoring, blocking, bridging and securing of components as required during the erection process.

B. Erect pre-engineered building in accordance manufacturer's instructions, erection drawings, and other erection documents.

C. Install roof panels, wall panels, and roof liner panels straight and true, free from defects in accordance manufacturer's instructions.

D. Paint burns, scars, welds, and damaged and rusted surfaces with cold galvanizing paint in accordance with ASTM A780.

E. Isolate dissimilar metal contact with proper taping and/or coatings.

F. Install flashings and accessories to provide a watertight system.

G. Cut and install insulation at in accordance with manufacturer's printed instructions and sealed to ensure continuity of building envelope, whether indicated or not.

H. Provide all accessories recommended by manufacturer for a complete installation.

3.3 INSPECTION

A. Architect and Contractor reserve the right to inspect the work during application. Upon completion of the work, if inspection discloses that roofing is not according to specifications or has been damaged, Contractor agrees to furnish additional materials necessary to make repairs and place work in an acceptable condition.

END OF SECTION

SECTION 133419-METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pre-engineered, shop fabricated structural steel building frame.

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC S335 - Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
2. AISC S342L - Load and Resistance Factor Design Specification for Structural Steel Buildings.
3. AISC S344L - Metric Load and Resistance Factor Design Specification for Structural Steel Buildings.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. ASTM A490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
7. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
8. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
9. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
10. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
11. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
12. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
13. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
14. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.

15. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
17. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. Metal Building Manufacturers Association:
1. MBMA - Low Rise Building Systems Manual.

E. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

F. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

G. Underwriters Laboratories Inc.:
1. UL - Building Materials Directory.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Single span rigid frame.

1.4 DESIGN REQUIREMENTS

A. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

B. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to applicable codes for submission of design calculations, reviewed shop and erection drawings, required for acquiring permits.

B. Cooperate with regulatory agency or authority and provide data as requested authority having jurisdiction.

1.6 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, loads, and reactions; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, method or installation; framing anchor bolt settings, sizes, and locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

C. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

PART 2 PRODUCTS

2.1 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

B. Provide framing for door window louver skylight, ventilator openings.

PART 3 EXECUTION

3.1 ERECTION - FRAMING

A. Erect framing in accordance with AISC Specification.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval of Architect/Engineer.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.2 ERECTION TOLERANCES

A. Framing Members: 1/4 inch from level;1/8 inch from plumb.

END OF SECTION

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SECTION 220100 - PLUMBING SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. RELATED SECTIONS
1. Section 013100 “Project Management and Coordination” for requirements for coordination drawings.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Division Section as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of Division 22 submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer’s and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Engineer’s final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for delivery.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer’s Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing and Project record drawings.

    a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Contractor shall execute a data licensing agreement in the form of Halff Associates’ Standard form.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. **Submit all submittal items required for each Specification Section within a Construction Division concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule. ***
    - **This submittal package shall be comprehensive document by Division and not piecemealed by specification section.**
3. Submit action submittals and informational submittals required by the same Specification Section concurrent.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for

coordination. For example, HVAC Equipment must be submitted and approved prior to approval of Electrical gear.

a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals is indicated, allow 15 working days for initial review of each submittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
3. Include the following information for processing and recording action taken:

a. Project name.
b. Date.
c. Name of Engineer.
d. Name of Construction Manager, where applicable.
e. Name of Contractor.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Division Section or number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, initial submittal may serve as final submittal.

a. When paper copies are required, submit one copy of submittal.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return without review submittals received from sources other than Contractor.
   a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Engineer.
      6) Name of Construction Manager, where applicable.
      7) Name of Contractor.
      8) Name of firm or entity that prepared submittal.
      9) Names of subcontractor, manufacturer, and supplier.
      10) Category and type of submittal.
      11) Submittal purpose and description.
      12) Specification Section number and title.
      13) Specification paragraph number or drawing designation and generic name for each of multiple items.
      14) Drawing number and detail references, as appropriate.
      15) Indication of full or partial submittal.
      16) Transmittal number, numbered consecutively.
      17) Submittal and transmittal distribution record.
      18) Remarks.
      19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item. Alternately, submit package as a comprehensive .pdf document by Division with each Specification Section tabbed.
2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:

   a. Project name.
   b. Date.
   c. Name and address of Engineer.
   d. Name of Construction Manager, where applicable.
   e. Name of Contractor.

f. Name of firm or entity that prepared submittal.
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Specification paragraph number or drawing designation and generic name for each of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.
r. Other necessary identification.
s. Remarks.

F. Options: Identify options requiring selection by Engineer.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer’s action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer’s action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web site or FTP site specifically established for Project.

a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

1. Action Submittals: For submittal formats 11 x 17 and larger, submit two paper copies of each submittal unless otherwise indicated in addition to the electronically posted submittal. Engineer will return one copy of paper submittal.
2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each construction Division and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data (8-1/2 x 11 format only) in the following format:

a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer, if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 11 x 17 but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
   a. Two opaque (bond) copies of each submittal. Engineer will return one copy. Engineer will return one copy. Submit also one electronic file for record keeping.

4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.

   a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
   b. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. "Samples for Verification" Subparagraph below can be used with or without Samples for initial selection. Revise to suit Project.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.

1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. After review provide specification compliance form and mark with approval stamp before submitting to Engineer.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Submittals not required by the Contract Documents may be returned by the Engineer without action.

END OF SECTION 220100

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SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
2. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
3. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 RELATED SECTIONS

A. Section 079200 “Joint Sealants”

B. Section 078413 “Penetration Firestopping”

C. Section 0076200 “Sheet Metal Flashing and Trim”

D. Section 078413 “Penetration Firestopping”

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

    a. Piping Smaller Than **NPS 6**: Galvanized-steel wall sleeves
    b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves.

2. Exterior Concrete Walls below Grade:

    a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

    a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

    a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
    b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

    a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
    b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517

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SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 RELATED SECTIONS

A. Related Sections:
1. Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
2. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

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SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Filled-system thermometers.
3. Liquid-in-glass thermometers.
4. Light-activated thermometers.
5. Thermowells.
6. Dial-type pressure gages.
7. Gage attachments.
8. Test plugs.
9. Test-plug kits.
10. Sight flow indicators.

B. Related Requirements:

1. Section 221113 "Facility Water Distribution Piping" for domestic water meters and combined domestic and fire-protection water-service meters outside the building.
2. Section 221119 "Domestic Water Piping Specialties" for water meters.
3. Section 221513 "General-Service Compressed-Air Piping" for compressed air gages.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ashcroft Inc.
2. Ernst Flow Industries.
3. Marsh Bellofram.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass or plastic.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ametek U.S. Gauge.
   b. Ashcroft Inc.
   c. Ernst Flow Industries.

2. Standard: ASME B40.100.
3. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch or 6-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Ring: Metal.
11. Accuracy: Grade C, plus or minus 3 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston or porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. IMI Flow Design, Inc.
2. Miljoco Corporation.
3. Nexus Valve, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.6 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. IMI Flow Design, Inc.
2. Miljoco Corporation.
3. Nexus Valve, Inc.

B. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.7 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ARCHON Industries, Inc.
2. Dwyer Instruments, Inc.
3. Ernst Flow Industries.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 125 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install test plugs in piping tees.

K. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.

L. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal case, vapor-actuated type.
3. Metal case, compact style, liquid-in-glass type.
4. Direct mounted, light-activated type.
5. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

B. Thermometers at inlets and outlets of each domestic water heat exchanger shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct mounted, metal-case, vapor-actuated type.
3. Metal case, compact-style, liquid-in-glass type.
4. Direct mounted, light-activated type.
5. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

C. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal-case, vapor-actuated type.
3. Metal case, compact-style, liquid-in-glass type.
4. Direct-mounted, light-activated type.
5. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

D. Thermometers at inlet and outlet of each remote domestic water chiller shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal-case, vapor-actuated type.
3. Metal case, compact-style, liquid-in-glass type.
4. Direct mounted, light-activated type.
5. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

E. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be one of the following:

1. Sealed, direct-mounted, metal case.
2. direct-mounted, plastic case.
3. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:

1. Sealed, direct-mounted, metal case.
2. Sealed, direct-mounted, plastic case.
3. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

C. Pressure gages at suction and discharge of each domestic water pump shall be[**one of**] the following:

1. Sealed, direct-mounted, metal case.
2. Sealed, direct-mounted, plastic case.
3. Test plug with chlorosulfonated polyethylene synthetic EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 160 psi.

END OF SECTION 220519

SECTION 220523 GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Bronze ball valves.
   2. Bronze lift check valves.
   3. Bronze swing check valves.
   4. Bronze gate valves.

B. Related Sections:
   1. Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
   2. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B31.1 for power piping valves.
2. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set gate valves closed to prevent rattling.
4. Set ball valves open to minimize exposure of functional surfaces.
5. Block check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

B. Valve Sizes: Same as upstream piping unless otherwise indicated.

C. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 and smaller.

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:
1. Grooved: With grooves according to AWWA C606.

2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

F. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.3 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:
1. Description:
a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Design: Vertical flow.
d. Body Material: ASTM B 61 or ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. Description:
a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.5 BRONZE GATE VALVES

A. Class 125, RS Bronze Gate Valves:
1. Description:
a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Shutoff Service: Ball or gate valves.
   2. Throttling Service: Ball valve.
   3. Pump-Discharge Check Valves:
      a. NPS 4 and Smaller: Bronze swing check valves with bronze disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
   4. For Grooved-End Copper Tubing: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 4 and Smaller:
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Ball Valves: Two piece, full port, bronze with bronze trim.
   3. Bronze Swing Check Valves: Class 125, bronze disc.
   4. Bronze Gate Valves: Class 125, NRS.

END OF SECTION 220523

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SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Steel ball valves.
4. Iron ball valves.
5. CPVC ball valves.
6. PVC ball valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

A. Brass Ball Valves, Two-Piece with Full Port and Brass Trim, Press Ends:
1. Description:

a. Standard: MSS SP-110 or MSS SP-145.
b. CWP Rating: Minimum 200 psig.
c. Body Design: Two piece.

d. Body Material: Forged brass.
e. Ends: Press.
f. Press Ends Connections Rating: Minimum 200 psig.
g. Seats: PTFE or RPTFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.
k. O-Ring Seal: Buna-N or EPDM.

B. Brass Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim, Press Ends:
1. Description:

a. Standard: MSS SP-110 or MSS SP-145.
b. CWP Rating: Minimum 200 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Press.
f. Press Ends Connections Rating: Minimum 200 psig.
g. Seats: PTFE or RPTFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.
k. O-Ring Seal: Buna-N or EPDM.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, One-Piece with Bronze Trim:

B. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Threaded or Soldered Ends:
1. Description:

a. Standard: MSS SP-110 or MSS-145.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

2.4 IRON BALL VALVES

A. Iron Ball Valves, Class 125:
1. Description:

a. Standard: MSS SP-72.
b. CWP Rating: 200 psig.

c. Body Design: Split body.
d. Body Material: ASTM A126, gray iron.
e. Ends: Flanged or threaded.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel.
i. Port: Full.

2.5 CPVC BALL VALVES

A. CPVC Union Ball Valves:
1. Description:

a. Standard: MSS SP-122.
b. Pressure Rating and Temperature: 125 psig at 73 deg F.
c. Body Material: CPVC.
d. Body Design: Union type.
e. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
f. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket or threaded.
g. Ball: CPVC; full port.
h. Seals: PTFE or EPDM-rubber O-rings.
i. Handle: Tee shaped.

B. CPVC Non-Union Ball Valves:
1. Description:

a. Standard: MSS SP-122.
b. Pressure Rating and Temperature: 125 psig 150 psig Insert value at 73 deg F Insert temperature.
c. Body Material: CPVC.
d. Body Design: Non-union type.
e. End Connections: Socket or threaded.
f. Ball: CPVC; full or reduced port.
g. Seals: PTFE or EPDM-rubber O-rings.
h. Handle: Tee shaped.

2.6 PVC BALL VALVES

A. PVC Union Ball Valves:
1. Description:

a. Standard: MSS SP-122.
b. Pressure Rating and Temperature: 125 psig at 73 deg F.
c. Body Material: PVC.
d. Body Design: Union type.
e. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
f. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket or threaded.
g. Ball: PVC; full port.
h. Seals: PTFE or EPDM-rubber O-rings.

i. Handle: Tee shaped.

B. PVC Non-Union Ball Valves:
1. Description:

a. Standard: MSS SP-122.
b. Pressure Rating and Temperature: 125 psig at 73 deg F.
c. Body Material: PVC.
d. Body Design: Non-union type.
e. End Connections: Socket or threaded.
f. Ball: PVC; full or reduced port.
g. Seals: PTFE or EPDM-rubber O-rings.
h. Handle: Tee shaped.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valves, one piece.
3. Bronze ball valves, one piece with bronze or stainless steel trim.
4. Brass ball valves, two-piece with full port and brass or stainless steel trim.
5. Bronze ball valves, two-piece with full port and bronze or brass stainless steel trim.
6. Brass ball valves, three-piece with full port and brass or stainless steel trim.
7. Bronze ball valve, three-piece with full port and bronze or brass, or stainless steel trim.
8. Bronze ball valves, two-piece with regular port and bronze or stainless steel trim.

B. Pipe NPS 2-1/2 and Larger:

1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Steel ball valves, Class 150 with full port.
3. Iron ball valves, Class 150.

3.5 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valve.
3. Bronze ball valve, one piece with bronze or stainless steel trim.
4. Brass ball valves, two-piece with full port and brass or stainless steel trim.
5. Bronze ball valves, two-piece with full port and bronze, brass or stainless steel trim.
6. Brass ball valves, three-piece with full port and brass or stainless steel trim.

7. Bronze ball valves, three-piece with full port and bronze, brass or stainless steel trim.
8. Bronze ball valves, two-piece with regular port and bronze or stainless steel trim.

B. Pipe NPS 2-1/2 and Larger:

1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Steel ball valves, Class 150 with full port.
3. Iron ball valves, Class 150.

3.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Brass ball valve, one piece. Provide with threaded or solder-joint ends.
2. Bronze ball valve, one piece with bronze or stainless steel trim. Provide with threaded or solder-joint ends.
3. Brass ball valves, two-piece with full port and brass stainless steel trim. Provide with threaded or solder joint ends.
4. Bronze ball valves, two-piece with full port and bronze, brass or stainless steel trim. Provide with threaded solder or press connection joint ends.
5. Brass ball valves, three-piece with full port and brass or stainless steel trim.
6. Bronze ball valves, three-piece with full port and bronze, brass or stainless steel trim.
7. Bronze ball valves, two-piece with regular port and bronze or stainless-steel trim.

B. Pipe NPS 2-1/2 and Larger:

1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Steel ball valves, Class 150 with full port.
3. Iron ball valves, Class 150.

C. CPVC Pipe NPS 4 and Smaller: Union-ball valve.

D. PVC Pipe NPS 4 and Smaller: Union-ball [**Non-union ball**] valve.

****** [OR] ******

END OF SECTION 220523.12

SECTION 220523.14 - CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze lift check valves.
2. Bronze swing check valves.
3. Bronze swing check valves, press ends.
4. Iron swing check valves.
5. Iron swing check valves with closure control.
6. Iron, grooved-end swing check valves.
7. Iron, center-guided check valves.
8. Iron, plate-type check valves.
9. CPVC ball check valves.
10. PVC ball check valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE LIFT CHECK VALVES

A. Bronze Lift Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A.Y. McDonald Mfg. Co.
b. American Valve, Inc.
c. Apollo Valves; a part of Aalberts Integrated Piping Systems.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Design: Vertical flow.
d. Body Material: ASTM B61 or ASTM B62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

B. Bronze Lift Check Valves with Nonmetallic Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Valves; a Crane Co. brand.
b. Jenkins Valves; a Crane Co. brand.
c. Jomar Valve.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Design: Vertical flow.
d. Body Material: ASTM B61 or ASTM B62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: NBR, PTFE.

2.3 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
b. Crane Valves; a Crane Co. brand.
c. Jenkins Valves; a Crane Co. brand.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

B. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    b. Crane Valves; a Crane Co. brand.
    c. Jenkins Valves; a Crane Co. brand.

2. Description:

    a. Standard: MSS SP-80, Type 4.
    b. CWP Rating: 200 psig.
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B62, bronze.
    e. Ends: Threaded or soldered. See valve schedule articles.
    f. Disc: PTFE.

C. Bronze Swing Check Valves, Press Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    b. Crane Valves; a Crane Co. brand.
    c. Elkhart Products Corporation.

2. Description:

    a. Standard: MSS SP-80 and MSS SP-139.
    b. CWP Rating: Minimum 200 psig.
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B584, bronze.
    e. Ends: Press.
    f. Press Ends Connection Rating: Minimum 200 psig
    g. Disc: Brass or bronze.

2.4 IRON SWING CHECK VALVES

A. Iron Swing Check Valves with Metal Seats, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International.
    b. APCO DeZurik Valve Co.
    c. Apollo Valves; a part of Aalberts Integrated Piping Systems.

2. Description:

    a. Standard: MSS SP-71, Type I.
    b. CWP Rating: 200 psig.

c. Body Design: Clear or full waterway.
d. Body Material: ASTM A126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.

B. Iron Swing Check Valves with Nonmetallic-to-Metal Seats, Class 125:

1. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Composition.
g. Seat Ring: Bronze.
h. Disc Holder: Bronze.
i. Disc: PTFE.
j. Gasket: Asbestos free.

2.5 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Iron Swing Check Valves with Lever- and Spring-Closure Control, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. APCO DeZurik Valve Co.
b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
c. Bray International, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed exterior lever and weight.

B. Iron Swing Check Valves with Lever and Weight-Closure Control, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. APCO DeZurik Valve Co.
b. Apollo Valves; a part of Aalberts Integrated Piping Systems.

c. Bray International, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed exterior lever and weight.

2.6 IRON, CENTER-GUIDED, SPRING-LOADED CHECK VALVES

A. Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International.
b. APCO DeZurik Valve Co.
c. Apollo Valves; a part of Aalberts Integrated Piping Systems.

2. Description:

a. Standard: MSS SP-125.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A126, gray iron.
d. Style: Compact wafer, spring loaded.
e. Seat: Bronze.

B. Iron Globe, Center-Guided Check Valves with Metal Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Crispin Valve.
b. DFT Inc.
c. Flomatic Valves.

2. Description:

a. Standard: MSS SP-125.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A126, gray iron.
d. Style: Globe, spring loaded.
e. Ends: Flanged.
f. Seat: Bronze.

C. Iron, Compact-Wafer, Center-Guided Check Valves with Resilient Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. APCO DeZurik Valve Co.
   b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   c. DFT Inc.

2. Description:

   a. Standard: MSS SP-125.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM A126, gray iron.
   d. Style: Compact wafer, spring loaded.
   e. Seat: EPDM or NBR.

D. Iron Globe, Center-Guided Check Valves with Resilient Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. DFT Inc.
   b. Val-Matic Valve & Manufacturing Corp.

2. Description:

   a. Standard: MSS SP-125.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM A126, gray iron.
   d. Style: Globe, spring loaded.
   e. Ends: Flanged.
   f. Seat: EPDM or NBR.

2.7 IRON, PLATE-TYPE CHECK VALVES

A. Iron, Dual-Plate Check Valves with Metal Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. APCO DeZurik Valve Co.
   b. Flomatic Valves.
   c. Keckley Company.

2. Standard: API 594.
3. CWP Rating: 200 psig.
4. Body Design: Wafer, spring-loaded plates.
5. Body Material: ASTM A126, gray iron.
6. Seat: Bronze.

B. Iron, Single-Plate Check Valves with Resilient Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Keckley Company.

2. Standard: API 594.
3. CWP Rating: 200 psig.
4. Body Design: Wafer, spring-loaded plate.
5. Body Material: ASTM A126, gray iron.
6. Seat: EPDM or NBR.

C. Iron, Dual-Plate Check Valves with Resilient Seat, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Keckley Company.
b. Sure Flow Equipment Inc.

2. Standard: API 594.
3. CWP Rating: 200 psig.
4. Body Design: Wafer, spring-loaded plates.
5. Body Material: ASTM A126, gray iron.
6. Seat: EPDM or NBR.

2.8 CPVC BALL CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Valve, Inc.
2. Asahi/America.
3. GF Piping Systems: Georg Fischer LLC.

B. Description:

1. Pressure Rating and Temperature: 125 psig at 73 deg F.
2. Body Material: CPVC.
3. Body Design: Union-type ball check.
4. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
5. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket or threaded.
6. Ball: CPVC.
7. Seals: EPDM- or FKM-rubber O-rings.

2.9 PVC BALL CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Valve, Inc.
2. Asahi/America.
3. GF Piping Systems: Georg Fischer LLC.

B. Description:

1. Pressure Rating and Temperature: 125 psig at 73 deg F Insert temperature.
2. Body Material: PVC.
3. Body Design: Union-type ball check.
4. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
5. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket or threaded.
6. Ball: PVC.
7. Seals: EPDM- or FKM-rubber O-rings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Check Valves: Install check valves for proper direction of flow.

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.

3. Lift Check Valves: With stem upright and plumb.

F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat or resilient-seat check valves.
c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered or press-ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
3. For Copper Tubing, NPS 5 and Larger: Flanged.
4. For Steel Piping, NPS 2 and Smaller: Threaded.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
6. For Steel Piping, NPS 5 and Larger: Flanged.
7. For Grooved-End Copper Tubing and Steel Piping: Grooved.

3.5 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG

A. Pipe NPS 2 and Smaller:

1. Vertical, Upflow Applications Only: Bronze lift check valves with bronze or nonmetallic disc, Class 150, with soldered or threaded end connections.
2. Horizontal and Vertical Applications: Bronze swing check valves with bronze or nonmetallic disc, Class 150, with soldered or threaded end connections.

B. Pipe NPS 2-1/2 and Larger:

1. Iron swing check valves with metal seats, Class 125, with threaded or flanged end connections.

2. Iron, grooved-end swing check valves, 300 CWP with threaded or flanged end connections.
3. Iron, dual-plate check valves with metal resilient seat,, with threaded or flanged end connections.
4. Iron, single-plate check valves with resilient seat, Class 125, with threaded or flanged end connections.

3.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze swing check valves with bronze or nonmetallic disc, Class 125, with soldered or threaded end connections.
2. Bronze swing check valves with press-end connections.

B. Pipe NPS 2-1/2 and Larger:

1. Iron swing check valves with metal nonmetallic-to-metal seats, Class 125, with flanged end connections.
2. Iron swing check valves with closure control lever and spring or weight, Class 125, with threaded or flanged end connections.
3. Iron, grooved-end swing check valves, 300 CWP.
4. Iron, center-guided check valves with compact wafer, Class 125.
5. Iron, center-guided check valves with globe, metal or resilient seat, Class 125, with threaded or flanged end connections.
6. Iron, dual-plate check valves with metal or resilient seat, Class 125, with threaded or flanged end connections.
7. Iron, single-plate check valves with resilient seat, Class 125, with threaded or flanged end connections.

C. CPVC Pipe NPS 4 and Smaller: CPVC ball check valve.

D. PVC Pipe NPS 2 and Smaller: PVC ball check valve.

END OF SECTION 220523.14

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

2. Division 07 Section “Roof Accessories”

3. Division 22 “Plumbing Fixture Sections.”

4. Division 09 “Division 09 Painting Sections”

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper B-Line, Inc.
    b. Flex-Strut Inc.
    c. Hayden Corp.
    d. Powerstrut Corporation.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.
8.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Low Type Pipe Stand(For single pipes ≤ 2 1/2" in diameter): Plastic base unit with galvanized steel rods and roller to support pipe, for roof installation without membrane penetration. Product equal to Portable Pipe Hanger #SS8-R.

C. High-Type, Single-Pipe Stand (For pipes > 2 1/2" in diameter):

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Plastic.
3. Vertical Members: Two HDG-channels.
4. Horizontal Member: HDG-steel channel.
5. Rod/Hanger: HDG continuous thread rod and clevis hanger.
6. Product equal to PPH #PS-1-2.

D. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: Plastic.
3. Vertical Members: Two or more HDG-steel channels.
4. Horizontal Member: HDG-steel channel.
5. Rod/Hanger: HDG continuous thread rod and clevis hangers, continuous thread rod.
6. Product equal to PPH #PSE-2-2.

E. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface with use of isolation pad. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use coated carbon-steel pipe hangers and supports metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.

F. Use padded hangers for piping that is subject to scratching.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
7. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
8. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
9. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
10. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
11. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
12. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
13. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

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SECTION 220548 - VIBRATION CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Isolation mounts.
2. Freestanding and restrained spring isolators.
3. Spring hangers.
4. Spring hangers with pre-compression.
5. Pipe riser resilient supports.
6. Resilient pipe guides.
7. Inertia, vibration isolation equipment bases.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

B. Delegated-Design Submittal: For vibration isolation details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation and for designing vibration isolation bases.
2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and

rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

C. Qualification Data: For professional engineer.

D. Welding certificates.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated in this specification or a comparable product by one of the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Mason Industries.
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation.
6. Vibration Mountings & Controls, Inc.

B. Mounts (Mason Industries #ND): Double-deflection type, with molded, neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range. Select with minimum deflection of 0.35” for application.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

C. Spring Isolators (Mason Industries #SLF): Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch-thick, neoprene isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

D. Restrained Spring Isolators (Mason Industries #SLR): Freestanding, steel, open-spring isolators with limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch-thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

E. Spring Hangers (Mason Industries #30N): Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, neoprene minimum 1 1/4" thick. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

F. Spring Hangers with Pre-compression (Mason Industries #PC30N): Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with spring pre-compressed and locked at rated compression until installation is complete.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

G. Pipe Riser Resilient Support (Mason Industries #ADA): All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch-thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psigand for equal resistance in all directions.

H. Resilient Pipe Guides (Mason Industries #VSG): Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch-thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of 1 5/8” motion or to meet location requirements.

2.2 VIBRATION ISOLATION EQUIPMENT BASES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated in this specification or a comparable product by one of the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Mason Industries.
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation.
6. Vibration Mountings & Controls, Inc.

B. Inertia Base (Mason Industries #K): Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inchclearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

    a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Install vibration control devices in accordance with schedule herein.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inches.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feeto.c., and longitudinal supports a maximum of 80 feeto.c.
3. Brace a change of direction longer than 12 feet.

C. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Test to 90 percent of rated proof load of device.
3. Measure isolator restraint clearance.
4. Measure isolator deflection.
5. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 PLUMBING VIBRATION-CONTROL DEVICE SCHEDULE

A. Supported or Suspended Equipment: Pump.

1. Equipment Location: Floor.

2. Isolator Type: Inertia Base with spring isolators.
3. Minimum Deflection:

    a. Through 60hp: 2.5”
    b. 75hp and greater: 3.5”

B. Supported or Suspended Equipment: Pump

1. Equipment Location: Suspended
2. Isolator Type: Spring Hanger.
3. Minimum Deflection

    a. Through 5hp: 1.5”
    b. 7 1/2hp and greater: 2.5”

C. Supported or Suspended Equipment: Piping within 30’ of pump

1. Equipment Location: Suspended
2. Isolator Type: Spring Hanger with Pre-compression
3. Minimum Deflection:

    a. Through 3” diameter: 0.75”
    b. 4-6” diameter: 1.5”
    c. Greater than 6” diameter: 2.5”

D. Supported or Suspended Equipment: Piping within 30’ of Pump

1. Equipment Location: Floor
2. Isolator Type: Restrained Spring Isolators
3. Minimum Deflection:

    a. Through 3” diameter: 0.75”
    b. 4-6” diameter: 1.5”
    c. Greater than 6” diameter: 2.5

END OF SECTION 220548

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 RELATED SECTIONS

a. Section 099123 “Interior Painting”

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch, Stainless steel, 0.025-inch, or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/2 inch for name of units for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/2 inch for name of units for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/2 inch for name of units for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 1 1/2 inches for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch, Stainless steel, 0.025-inch, or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Pipe Label Color Schedule:

1. Low-Pressure, Compressed-Air Piping:

   a. Background Color: Blue.
   b. Letter Color: White.

2. Domestic Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3. Sanitary Waste and Storm Drainage Piping:

   a. Background Color: Black.
   b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

   a. Cold Water: 1-1/2 inches round.
   b. Hot Water: 1-1/2 inches round.
   c. Low-Pressure Compressed Air: 1-1/2 inches round.

2. Valve-Tag Color:

   a. Cold Water: Green.
   b. Hot Water: Green.
   c. Low-Pressure Compressed Air: Blue.

3. Letter Color:

   a. Cold Water: White.
   b. Hot Water: White.
   c. Low-Pressure Compressed Air: White.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 RELATED SECTIONS

A. Division 22 Section “Hangers and Supports for Plumbing Piping and Equipment”

B. Division 07 Section “Penetration Firstopping”

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Qualification Data: For qualified Installer.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation

materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pittsburgh Corning Corporation; Foamglas.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; SOFTR All-Service Duct Wrap.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000-Degree Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

J. Phenolic:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Kingspan Tarec Industrial Insulation NV; Koolphen K.
    b. Resolco International BV; Insul-phen.

2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
5. Factory-Applied Jacket: ASJ. Requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc.; 81-84.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc.; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc.; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc.; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-96.
    b. Foster Brand, Specialty Construction Brands, Inc.; 81-33.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc.; 85-20.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-30.
    b. Eagle Bridges - Marathon Industries; 501.
    c. Foster Brand, Specialty Construction Brands, Inc.; 30-35.
    d. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; Encacel.
    b. Eagle Bridges - Marathon Industries; 570.
    c. Foster Brand, Specialty Construction Brands, Inc.; 60-95/60-96.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc.; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc.; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc.; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc.; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: Gray.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc.; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc.; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc.; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc.; Chil-Glas Number 10.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Brand, Specialty Construction Brands, Inc.; Metal Jacketing Systems.
   b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
   c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 488 AWF.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    c. Compac Corporation; 120.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ITW Insulation Systems; Gerrard Strapping and Seals.
   b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

2. Stainless Steel: ASTM A 167 or ASTM A 240 Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. C & F Wire.

2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Engineered Brass Company.
   b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
   c. McGuire Manufacturing.
   d. Plumberex.
   e. Truebro; a brand of IPS Corporation.
   f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.

2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. All sizes: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
b. Phenolic: 1 inch thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 1/2 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

C. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
b. Phenolic: 2 inches thick.

3.15 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Loose-fill insulation, for belowground piping, is specified in Division 33 piping distribution Sections.

B. Domestic Chilled Water (Potable), All Sizes: Cellular glass, 2 inches thick.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. Factory-applied ASJ.

D. Piping, Exposed:

1. Factory-applied ASJ.

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. Aluminum, Smooth 0.020 inch thick.

D. Piping, Exposed:

1. Aluminum, Smooth with Z-Shaped Locking Seam: 0.020 inch thick.

3.18 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.

1.3 RELATED SECTIONS

1. Section 220519 “Meters and Gages for Plumbing Piping”
2. Section 221119 “Domestic Water Piping Specialties”
3. Section 220519 "Meters and Gages for Plumbing Piping."
4. Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
5. Section 220518 "Escutcheons for Plumbing Piping."
6. Section 220529 “Hangers and Supports for Plumbing Piping and Equipment”
7. Section 220553 “Identification for Plumbing Piping and Equipment”

1.4 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.5 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.6 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect and/or Engineer no fewer than three days in advance of proposed interruption of water service.
2. Do not interrupt water service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings:

1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

H. Copper-Tube, Extruded-Tee Connections:

1. Description: Tee formed in copper tube according to ASTM F 2014.

I. Appurtenances for Grooved-End Copper Tubing:

1. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B 584 bronze castings.
2. Mechanical Couplings for Grooved-End Copper Tubing:

a. Copper-tube dimensions and design similar to AWWA C606.
b. Ferrous housing sections.
c. EPDM-rubber gaskets suitable for hot and cold water.
d. Bolts and nuts.
e. Minimum Pressure Rating: 300 psig.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Solder Filler Metals: ASTM B 32, lead-free alloys.

C. Flux: ASTM B 813, water flushable.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: tube.

C. Color: Black or natural.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Standard: ASSE 1079.
2. Pressure Rating: 150 psig.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 150 psig.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Nonconducting materials for field assembly of companion flanges.
2. Pressure Rating: 150 psig.
3. Gasket: Neoprene or phenolic.
4. Bolt Sleeves: Phenolic or polyethylene.
5. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F 1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure

gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install domestic water piping level without pitch and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

P. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

Q. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

H. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

I. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

J. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 and larger, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

F. Aboveground domestic water piping, NPS 4 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed joints.

G. Aboveground domestic water piping, NPS 5 and larger, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use full-port ball or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball valves for all piping.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

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SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Strainers.
4. Outlet boxes.
5. Hose bibbs.
6. Wall hydrants.
7. Drain valves.
8. Water-hammer arresters.
9. Air vents.
10. Trap-seal primer device.
11. Flexible connectors.

B. Related Sections:
1. Section 221116 "Domestic Water Piping" for water meters.
2. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.
3. Section 224713 "Drinking Fountains" for water filters for water coolers.
4. Section 061000 "Rough Carpentry."
5. Section 260526 "Grounding and Bonding for Electrical Systems."
6. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.
7. Section 220553 "Identification for Plumbing Piping and Equipment."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/2 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

C. Pressure Vacuum Breakers

1. Standard: ASSE 1020.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Accessories:

a. Valves: Ball type, on inlet and outlet.

D. Laboratory-Faucet Vacuum Breakers:

1. Standard: ASSE 1035.
2. Size: NPS 1/2 or NPS 3/8 matching faucet size.
3. Body: Bronze.
4. End Connections: Threaded.
5. Finish: Chrome plated.

E. Spill-Resistant Vacuum Breakers:

a.

2. Standard: ASSE 1056.
3. Operation: Continuous-pressure applications.
4. Accessories:

a. Valves: Full-Port Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 10 psig maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 and smaller; steel with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through or vertical flow.
7. Accessories:

a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 and smaller; steel with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.
7. Accessories:

a. ValvesNPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
b. ValvesNPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

C. Hose-Connection Backflow Preventers:

1. Standard: ASSE 1052.
2. Operation: Up to 10-foot head of water back pressure.
3. Inlet Size: NPS 1/2 or NPS 3/4.
4. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
5. Capacity: At least 3-gpm flow.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.062 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
    c. Strainers NPS 5 and Larger: 0.125 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.6 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Mounting: Recessed.
2. Material and Finish Stainless-steel box and faceplate.
3. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
4. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
5. Drain: NPS 1-1/2 standpipe and P-trap for direct waste connection to drainage piping.
6. Inlet Hoses: Two 60-inch long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
7. Drain Hose: One 48-inch long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes:

1. Mounting: Recessed.
2. Material and Finish Stainless-steel box and faceplate.
3. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
4. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.7 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include wall flange with each chrome- or nickel-plated hose bibb.

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrant.

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Rough bronze.
11. Operating Keys(s): One with each wall hydrant.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.

6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.11 AIR VENTS

A. Bolted-Construction Automatic Air Vents.

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents.

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.12 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.13 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install water-control valves with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

G. Install water-hammer arresters in water piping according to PDI-WH 201.

H. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Reduced-pressure-principle backflow preventers.
   2. Double-check, backflow-prevention assemblies.
   3. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
   4. Outlet boxes.
   5. Supply-type, trap-seal primer valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

   1. Test each backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 221119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Horizontally mounted, in-line, close-coupled centrifugal pumps.

1.3 RELATED SECTIONS

A. Section 220513 "Common Motor Requirements for Plumbing Equipment."

B. Section 220548 "Vibration Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.

C. Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

D. Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

E. Section 220523 "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."

F. Section 220519 "Meters and Gages for Plumbing Piping."

G. Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

1.4 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals, owner training, and warranty.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Corporation.
3. TACO Incorporated.
4. Grundfos

B. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.

C. Pump Construction:

1. Casing: Radially split with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
2. Impeller: Statically and dynamically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
5. Bearings: Oil-lubricated; bronze-journal or ball type.
6. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

D. Motor: Single speed, with grease-lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 CONTROLS

A. Timers: Electric, for control of hot-water circulation pump.

1. Type: Programmable, seven-day clock with manual override on-off switch.
2. Enclosure: NEMA 250, Type 1, suitable for wall mounting.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install horizontally mounted, in-line, close-coupled centrifugal pumps with shaft(s) horizontal.

C. Install continuous-thread hanger rods and spring hangers with vertical-limit stop of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Section 220548 "Vibration Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

D. Install timers on equipment room wall in readily accessible area.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:
   a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
   b. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."

2. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."
3. Install pressure gage at suction of each pump and pressure gage at discharge of each pump. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."

D. Connect timers to pumps that they control.

3.4 IDENTIFICATION

A. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set timers, for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.6 ADJUSTING

A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123

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SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections:

1. Section 31200 “Earth Moving”
2. Section 221319 "Sanitary Waste Piping Specialties."
3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
4. Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
5. Section 220523 “General-Duty Valves for Plumbing Piping”
6. Section 220529 “Hangers and Supports for Plumbing Piping and Equipment”
7. Section 220553 “Identification for Plumbing Piping and Equipment”

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Waste, Force-Main Piping: 100 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect and/or Engineer no fewer than three days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings:

1. Standards: ASTM C 1277 and ASTM C 1540.
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASTM B 88, Type M, water tube, drawn temper.

D. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

E. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Standard: ASTM C 1173.
    b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    c. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

    a. Standard: ASTM C 1460.
    b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

5. Pressure Transition Couplings:

    a. Standard: AWWA C219.
    b. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
    c. Center-Sleeve Material: Manufacturer's standard.
    d. Gasket Material: Natural or synthetic rubber.
    e. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

    a. Description:

        1) Standard: ASSE 1079.
        2) Pressure Rating: 150 psig.
        3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

    a. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 150 psig.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

a. Description:

1) Standard: IAPMO PS 66
2) Electroplated steel nipple.
3) Pressure Rating: 300 psig at 225 deg F.
4) End Connections: Male threaded or grooved.
5) Lining: Inert and noncorrosive, propylene.

2.7 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Tube.

D. Color: Black.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312100 "Excavation, backfill, and grading for sitework."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction

loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install steel piping according to applicable plumbing code.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Install aboveground PVC piping according to ASTM D 2665.

Q. Install underground PVC piping according to ASTM D 2321.

R. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

S. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

X. For PVC piping installed in a return air plenum, contractor shall wrap pipe in an approved fire wrap insulation.

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

E. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

F. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

G. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:

    a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
    b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.

2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

H. Install supports for vertical copper tubing every 10 feet.

I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

J. Install supports for vertical PVC piping every 48 inches.

K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings heavy-duty hubless-piping couplings; and coupled joints.
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 6 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings heavy-duty hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Aboveground, vent piping NPS 6 and larger shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Through-penetration firestop assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.
7. Oil interceptors.

1.3 RELATED SECTIONS

A. Section Includes:

1. Section 03300 “Cast-in-Place Concrete”.
2. Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements.
3. Section 260526 "Grounding and Bonding for Electrical Systems."
4. Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
5. Section 076200 "Sheet Metal Flashing and Trim."

1.4 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
   1. Oil interceptors.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

   1. Wiring Diagrams: Power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.9 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Metal Floor Cleanouts
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co..
c. Tyler Pipe; Wade Div.
d. Watts Drainage Products Inc.
e. Zurn Plumbing.

2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Threaded.
8. Closure: Cast-iron plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Painted cast iron.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.
16. Housing: Stainless steel.
17. Closure: Stainless steel with seal.
18. Riser: Stainless-steel drainage pipe fitting to cleanout.

B. Cast-Iron Wall Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, stainless-steel cover plate with screw.
8. Wall Access: Round stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Josam Company; Josam Div.
b. MIFAB, Inc.

c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing.

2. Refer to plumbing fixture schedule.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
2. Size: Same as connected soil, waste, or vent stack.
3. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
5. Special Coating: Corrosion resistant on interior of fittings.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

a. NPS 2: 4-inch minimum water seal.
b. NPS 2-1/2 and Larger: 5-inch minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

H. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft, 0.0469-inch thickness.

3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting: Install above grade grease interceptors and solids interceptors on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases specified in Section 033000 "Cast-in-Place Concrete."

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct bases to withstand, without damage to equipment, seismic force required by code.
3. Construct concrete bases 4 inches high and extend base not less than 6 inches in all directions beyond the maximum dimensions of interceptors, unless otherwise indicated.
4. Minimum Compressive Strength: 4000 psi at 28 days.
5. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
6. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
7. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
8. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 1 inch above floor.

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

O. Install wood-blocking reinforcement for wall-mounting-type specialties.

P. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

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SECTION 221513 - GENERAL-SERVICE COMPRESSED-AIR PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig or less.

B. ABS: Acrylonitrile-butadiene-styrene plastic.

C. CR: Chlorosulfonated polyethylene synthetic rubber.

D. EPDM: Ethylene-propylene-diene terpolymer rubber.

E. HDPE: High-density polyethylene plastic.

F. NBR: Acrylonitrile-butadiene rubber.

G. PE: Polyethylene plastic.

H. PVC: Polyvinyl chloride plastic.

I. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig or less.

1.3 RELATED SECTIONS

A. Section 220523.12 "Ball Valves for Plumbing Piping"

B. Section 220523.13 "Butterfly Valves for Plumbing Piping"

C. Section 220523.14 "Check Valves for Plumbing Piping"

D. Section 220523.15 "Gate Valves for Plumbing Piping"

E. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

F. Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

G. Section 220518 "Escutcheons for Plumbing Piping."

H. Section 220519 “Meters and Gages for Plumbing Piping.”

I. Section 220529 “Hangers and Supports for Plumbing Piping and Equipment” for pipe hanger and support devices.

J. Section 220553 “Identification for Plumbing Piping and Equipment”

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Plastic pipes, fittings, and valves.
2. Dielectric fittings.
3. Flexible pipe connectors.
4. Safety valves.
5. Pressure regulators. Include rated capacities and operating characteristics.
6. Automatic drain valves.
7. Filters. Include rated capacities and operating characteristics.
8. Lubricators. Include rated capacities and operating characteristics.
9. Quick couplings.
10. Hose assemblies.

1.5 INFORMATIONAL SUBMITTALS

A. Brazing and welding certificates.

B. Qualification Data: For Installers.

C. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Extruded-Tee Outlet Procedure: Qualify operators according to training provided by T-DRILL Industries Inc., for making branch outlets.
2. Pressure-Seal Joining Procedure for Copper Tubing: Qualify operators according to training provided by Viega; Plumbing and Heating Systems.
3. Pressure-Seal Joining Procedure for Steel Piping. Qualify operators according to training provided by Victaulic Company.

B. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

D. ASME Compliance:

1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed-air piping.
2. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Compressed-Air Service: Do not interrupt compressed-air service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary compressed-air service according to requirements indicated:

1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of compressed-air service.
2. Do not proceed with interruption of compressed-air service without Architect's and Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Schedule 40, Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.

1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
4. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
5. Wrought-Steel Butt-Welding Fittings: ASME B16.9, Schedule 40.
6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
7. Grooved-End Fittings and Couplings:
    a. Grooved-End Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron casting; with grooves according to AWWA C606 and dimensions matching steel pipe.
    b. Couplings: AWWA C606 or UL 213, for steel-pipe dimensions and rated for 300-psig minimum working pressure. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gaskets for oil-free compressed air. Provide NBR gaskets if compressed air contains oil or oil vapor.

B. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B seamless, drawn-temper, water tube.

1. Wrought-Copper Fittings: MSS SP-73, wrought copper with dimensions for brazed joints.
2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
3. Copper Unions: ASME B16.22 or MSS SP-123.
4. Press-Type Fittings, NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
5. Extruded-Tee Outlets: Procedure for making branch outlets in copper tube according to ASTM F 2014.
6. Grooved-End Fittings and Couplings:
   a. Grooved-End Fittings: ASTM B 75 (ASTM B 75M), copper tube or ASTM B 584, bronze castings.
   b. Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gasket for oil-free compressed air. Provide NBR gasket if compressed air contains oil or oil vapor.

C. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.3 VALVES

A. Metal Ball, Butterfly, Check, and Gate Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Description:

      a. Standard: ASSE 1079.
      b. Pressure Rating: 125 psig minimum at 180 deg F (82 deg C).
      c. End Connections: threaded ferrous.

C. Dielectric Flanges:
   1. Description:

      a. Standard: ASSE 1079.
      b. Factory-fabricated, bolted, companion-flange assembly.
      c. Pressure Rating: 125 psig minimum at 180 deg F (82 deg C).
      d. End Connections: threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
   1. Description:

      a. Nonconducting materials for field assembly of companion flanges.
      b. Pressure Rating: 150 psig.
      c. Gasket: Neoprene or phenolic.
      d. Bolt Sleeves: Phenolic or polyethylene.
      e. Washers: Phenolic with steel backing washers.

2.5 FLEXIBLE PIPE CONNECTORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

   1. Working-Pressure Rating: 200 psig minimum.
   2. End Connections, NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
   3. End Connections, NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

   1. Working-Pressure Rating: 200 psig minimum.
   2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.

2.6 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.

1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig inlet pressure, unless otherwise indicated.

1. Type: Pilot operated.

C. Air-Line Pressure Regulators: Diaphragm or pilot operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure, unless otherwise indicated.

D. Air-Line Pressure Regulators: Diaphragm operated, aluminum alloy or plastic body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig Insert pressure minimum inlet pressure, unless otherwise indicated.

E. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate. Include mounting bracket if wall mounting is indicated.

F. Coalescing Filters: Coalescing type with activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded. Include mounting bracket if wall mounting is indicated.

G. Mechanical Filters: Two-stage, mechanical-separation-type, air-line filters. Equip with deflector plates, resin-impregnated-ribbon-type filters with edge filtration, and drain cock. Include mounting bracket if wall mounting is indicated.

H. Air-Line Lubricators: With drip chamber and sight dome for observing oil drop entering air stream; with oil-feed adjustment screw and quick-release collar for easy bowl removal. Include mounting bracket if wall mounting is indicated.

1. Provide with automatic feed device for supplying oil to lubricator.

2.7 QUICK COUPLINGS

A. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

B. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.

2. Plug End: Straight-through type with barbed outlet for attaching hose.

C. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
2. Plug End: With barbed outlet for attaching hose.

2.8 HOSE ASSEMBLIES

A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig minimum working pressure, unless otherwise indicated.

1. Hose: Reinforced single- or double-wire-braid, CR-covered hose for compressed-air service.
2. Hose Clamps: Stainless-steel clamps or bands.
3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Compressed-Air Piping between Air Compressors and Receivers: Use one of the following piping materials for each size range:
1. NPS 2-1/2 to NPS 4 : Schedule 40, black galvanized-steel pipe; threaded, malleable-iron fittings; and threaded joints.

B. Low-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:

1. NPS 2 and Smaller: Schedule 40, black galvanized-steel pipe; threaded, malleable-iron fittings; and threaded joints.

C. Drain Piping: Use the following piping materials:

1. NPS 2 and Smaller: Type M copper tube; wrought-copper fittings; and brazed joints.

3.2 VALVE APPLICATIONS

A. Metal General-Duty Valves: Comply with requirements and use valve types specified in "Valve Applications" Articles in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves

for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping, according to the following:

1. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
2. Equipment Isolation NPS 2 and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
3. Grooved-end valves may be used with grooved-end piping and grooved joints.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install piping adjacent to equipment and machines to allow service and maintenance.

F. Install air and drain piping with 1 percent slope downward in direction of flow.

G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Equipment and Specialty Flanged Connections:

1. Use steel companion flange with gasket for connection to steel pipe.
2. Use cast-copper-alloy companion flange with gasket and brazed joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

I. Flanged joints may be used instead of specified joint for any piping or tubing system.

J. Extended-tee outlets with brazed branch connection may be used for copper tubing, within extruded-tee connection diameter to run tube diameter ratio for tube type, according to Extruded Tee Connections Sizes and Wall Thickness for Copper Tube (Inches) Table in ASTM F 2014.

K. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

L. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

M. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping."

N. Install piping to permit valve servicing.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install seismic restraints on piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints for Steel Piping: Join according to AWS D10.12/D10.12M.

E. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Extruded-Tee Outlets for Copper Tubing: Form branches according to ASTM F 2014, with tools recommended by procedure manufacturer, and using operators qualified according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

H. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.

I. Pressure-Sealed Joints: Join with tools recommended by fitting manufacturer, using operators

J. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.5 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. NPS 2 and Smaller: Use dielectric unions.

3.7 FLEXIBLE PIPE CONNECTOR INSTALLATION

A. Install flexible pipe connectors in discharge piping and in inlet air piping from remote air-inlet filter of each air compressor.

B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.

C. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

3.8 SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air-main pressure regulators in compressed-air piping at or near air compressors.

C. Install air-line pressure regulators in branch piping to equipment and tools.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

E. Install coalescing filters in compressed-air piping at or near air compressors and upstream from mechanical filters. Mount on wall at locations indicated.

F. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters. Mount on wall at locations indicated.

G. Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.

H. Install quick couplings at piping terminals for hose connections.

I. Install hose assemblies at hose connections.

3.9 CONNECTIONS

A. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.10 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

C. Vertical Piping: MSS Type 8 or 42, clamps.

D. Individual, Straight, Horizontal Piping Runs:

1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
2. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

E. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

F. Base of Vertical Piping: MSS Type 52, spring hangers.

G. Support horizontal piping within 12 inches of each fitting and coupling.

H. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

I. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4 to NPS 1/2: 96 inches with 3/8-inch rod.
2. NPS 3/4 to NPS 1-1/4: 84 inches with 3/8-inch rod.

J. Install supports for vertical, Schedule 40, steel piping every 15 feet (4.6 m).

K. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4: 60 inches with 3/8-inch rod.
2. NPS 3/8 and NPS 1/2: 72 inches with 3/8-inch rod.
3. NPS 3/4: 84 inches with 3/8-inch rod.
4. NPS 1: 96 inches with 3/8-inch rod.
5. NPS 1-1/4: 108 inches with 3/8-inch rod.

L. Install supports for vertical copper tubing every 10 feet.

M. Install supports for vertical HDPE piping every 48 inches.

3.11 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.12 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:

1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.
3. Inspect filters, lubricators, and pressure regulators for proper operation.

C. Prepare test reports.

END OF SECTION 221513

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Flow-control, electric, tankless, domestic-water heaters.

1.3 RELATED SECTIONS

1. Section 221116 “Domestic Water Piping”
2. Section 220553 “Identification for Plumbing and Equipment”
3. Section 014000 "Quality Requirements" for retesting and reinspecting requirements .
4. Section 017300 "Execution" for requirements for correcting the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of commercial and tankless, electric, domestic-water heater, from manufacturer.

B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including storage tank and supports.
    b. Faulty operation of controls.
    c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

    a. Electric, Tankless, Domestic-Water Heaters: Five year(s).

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bosch Water Heating.
    b. Chronomite Laboratories, Inc.
    c. Eemax, Inc.

2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

    a. Connections: ASME B1.20.1 pipe thread.
    b. Pressure Rating: 150 psig.
    c. Heating Element: Resistance heating system.
    d. Temperature Control: Flow-control fitting.
    e. Safety Control: High-temperature-limit cutoff device or system.
    f. Jacket: Aluminum or steel with enameled finish or plastic.

4. Support: Bracket for wall mounting.

5. Manufacturer shall provide verification of warranty regardless of water hardness.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain, electric, domestic-water heaters.

END OF SECTION 223300

SECTION 224223 - COMMERCIAL SHOWERS, RECEPTORS, AND BASINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Individual shower receptors.
2. Shower faucets.
3. Shower basins.
4. Grout.

1.3 RELATED SECTIONS

A. Section Includes:
1. Section 220523 "General-Duty Valves for Plumbing Piping."
2. Section 220518 "Escutcheons for Plumbing Piping."
3. Section 079200 "Joint Sealants."
4. Section 221116 "Domestic Water Piping."
5. Section 221316 "Sanitary Waste and Vent Piping."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for showers and basins.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower faucets to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 INDIVIDUAL SHOWERS

A. Individual Showers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include but are not limited to, the following:
   a. Aqua Glass Corporation.
   b. Jacuzzi Inc.
   c. Kohler Co.

2. General: shower enclosure with faucet and receptor and appurtenances.
3. Standard: ANSI Z124.1.2. Refer to plumbing fixture schedule.

2.2 SHOWER FAUCETS

A. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.

B. Shower Faucets:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following

   a. American Standard America.
   b. Chicago Faucets.
   c. Kohler Co.
   d. Moen Incorporated.
   e. Powers; a division of Watts Water Technologies, Inc.

2. Description: Single-handle, mixing valve with hot- and cold-water indicators; check stops; and shower head. Refer to plumbing fixture schedule.

2.3 SHOWER BASINS

A. Shower Basins: Solid-surface shower basin.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include the following:
   a. LASCO Bathware.
   b. Aker Division.
   c. a Kohler company.
   d. American Standard America.
   e. Crane Plumbing, L.L.C.
   f. Kohler Co.

2. General: Solid-surface base for built-up-type shower fixture. Refer to plumbing fixture schedule.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.

B. Examine walls and floors for suitable conditions where showers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble shower components according to manufacturers' written instructions.

B. Install showers level and plumb according to roughing-in drawings.

C. Install water-supply piping with stop on each supply to each shower faucet.

1. Exception: Use full-port ball, gate, or globe valves if supply stops are not specified with shower. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
2. Install stops in locations where they can be easily reached for operation.

D. Install shower flow-control fittings with specified maximum flow rates in shower arms.

E. Set shower receptors and basins in leveling bed of cement grout.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with traps and soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of showers and basins, inspect and repair damaged finishes.

B. Clean showers and basins, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of showers and basins for temporary facilities unless approved in writing by Owner.

END OF SECTION 224223

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.

1.3 RELATED SECTIONS

1. Section 220518 “Escutcheons for Plumbing Piping.”
2. Section 079200 “Joint Sealants”
3. Section 221116 “Domestic Water Piping”
4. Section 221316 “Sanitary Waste and Vent Piping”

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Standard America.
    b. Kohler Co.
    c. TOTO USA, INC.
    d. Zurn Industries, Incl

2. Bowl:

    a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    b. Material: Vitreous china.
    c. Type: Siphon jet.
    d. Style: Flushometer valve.
    e. Rim Contour: Elongated.
    f. Spud Size and Location: NPS 1-1/2; top.
    g. Color: White, UNO.

3. Bowl-to-Drain Connecting Fitting: ASTM A 1045.

4. Refer to Plumbing Schedule for Specification Standards.

2.2 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Sloan Valve Company.
    b. Zurn Industries, LLC.
    c. Kohler Co.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Minimum Inlet: NPS 1.
9. Minimum Outlet: NPS 1-1/4.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Bemis Manufacturing Company.
c. Church Seats.
d. Kohler Co.
e. Olsonite Seat Co.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Heavy duty).
5. Shape: To match bowl.
6. Hinge: Self-sustaining.
7. Hinge Material: Noncorroding metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.

4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls at the cost to the contractor.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

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SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.

1.3 RELATED SECTIONS

A. Section Includes:

1. Section 017823 "Operation and Maintenance Data."
2. Section 220518 “Escutcheons for Plumbing Piping.”
3. Section 079200 "Joint Sealants."
4. Section 220719 "Plumbing Piping Insulation."
5. Section 221316 “Sanitary Waste and Vent Piping.”

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

A. Lavatory Oval, self-rimming, vitreous china, counter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Crane Plumbing, L.L.C.
c. Kohler Co.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: Self-rimming for above-counter mounting.
c. Faucet-Hole Location: Top.
d. Mounting Material: Sealant.
e. Refer to plumbing fixture schedule for additional information.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Crane Plumbing, L.L.C.
c. Kohler Co.
d. Zurn Ind. Inc.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Mounting Material: Chair carrier.
d. Refer to Plumbing fixture schedule for additional information.

3. Support: ASME A112.6.1M, Type II concealed-arm lavatory carrier.

2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type, commercial, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. American Standard America.
b. Bradley Corporation.
c. Chicago Faucets.
d. Elkay Manufacturing Co.
e. T & S Brass and Bronze Works, Inc.
f. Kohler Co.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Material: Commercial, solid brass.
5. Refer to plumbing schedule for additional information.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

1. NPS 1/2.
2. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.5 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated, brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

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SECTION 224216.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service basins.
2. Utility sinks.
3. Handwash sinks.
4. Sink faucets.
5. Supply fittings.
6. Waste fittings.

1.3 RELATED SECTIONS

A. Section Includes:
1. Section 220523 "General-Duty Valves for Plumbing Piping."
2. Section 220518 “Escutcheons for Plumbing Piping.”
3. Section 079200 "Joint Sealants."
4. Section 220719 "Plumbing Piping Insulation."
5. Section 221116 “Domestic Water Piping.”
6. Section 221316 “Sanitary Waste and Vent Piping.”

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 SERVICE BASINS

A. Service Basins: Terrazzo, floor mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. Crane Plumbing, L.L.C.
c. Florestone Products Co., Inc.
d. Stern-Williams Co., Inc.

2. Fixture:

a. Standard: IAPMO PS 99.
b. Shape: Five sided.
c. Nominal Size: 24 by 24 inches.
d. Height: 12 inches with dropped front.
e. Tiling Flange: On two sides.
f. Rim Guard: On all top surfaces.
g. Drain: Grid with NPS 3 outlet.

3. Mounting: On floor and flush to wall.
4. Refer to plumbing schedule for specification standards.

2.2 UTILITY SINKS

A. Utility Sinks: Stainless steel, counter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkay Manufacturing Co.
b. Kohler Co.

c. Just Manufacturing.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Type: Ledge back.

3. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2, ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

4. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: NPS 2.
2) Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
3) Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

5. Mounting: On counter with sealant.

6. Refer to Plumbing Schedule for Specifications Standards.

2.3 HANDWASH SINKS

A. Handwash Sinks: Stainless steel, wall mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkay Manufacturing Co.
b. Kohler Co.
c. Just Manufacturing.

2. Fixture:

a. Standards: ASME A112.19.3/CSA B45.4 and NSF/ANSI 2.
b. Type: Basin with radius corners, back for faucet, and support brackets.

3. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
4. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

5. Support: ASME A112.6.1M, Type II, sink carrier.
6. Refer to Plumbing Schedule for Specification Standards.

2.4 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual type, two-lever-handle mixing valve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Standard America.
   b. Bradley Corporation.
   c. Chicago Faucets.
   d. Elkay Manufacturing Co.
   e. T & S Brass and Bronze Works, Inc.
   f. Kohler Co.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Material: Commercial, solid brass.
5. Finish: Chrome plated.
6. Refer to Plumbing Schedule for Specification Standards.

2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

1. NPS 1/2
2. ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.6 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2.
2. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

2.7 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls at the cost to the contractor.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 224500 - EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Combination units.
   2. Water-tempering equipment.

1.3 RELATED SECTIONS

A. Section Includes:
   1. Section 220523 "General-Duty Valves for Plumbing Piping."
   2. Section 221116 “Domestic Water Piping.”
   3. Section 221316 “Sanitary Waste and Vent Piping.”
   4. Section 220518 “Escutcheons for Plumbing Piping.”

1.4 DEFINITIONS

A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.

C. Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.

D. Tepid: Moderately warm.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.

B. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For emergency plumbing fixtures to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

D. Regulatory Requirements: Comply with requirements in ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities" Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

PART 2 - PRODUCTS

2.1 COMBINATION UNITS

A. Accessible, Plumbed Emergency Shower with Eyewash Combination Units:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Safety; a division of Acorn Engineering Company.
b. Bradley Corporation.
c. Encon Safety Products.
d. Guardian Equipment Co.
e. Haws Corporation.
f. Sellstrom Manufacturing Company.
g. Speakman Company.
h. WaterSaver Faucet Co.

2. Piping:

a. Material: Galvanized steel.
b. Unit Supply: NPS 1-1/4 minimum.
c. Unit Drain: Outlet at back or side near bottom.

3. Shower:

a. Capacity: Not less than 20 gpm for at least 15 minutes.
b. Supply Piping: NPS 1 with flow regulator and stay-open control valve.
c. Control-Valve Actuator: Pull rod.
d. Shower Head: 8-inch minimum diameter, stainless steel or plastic.
e. Mounting: Pedestal.

4. Eyewash Unit:

a. Capacity: Not less than 0.4 gpm for at least 15 minutes.
b. Supply Piping: NPS 1/2 with flow regulator and stay-open control valve.
c. Control-Valve Actuator: Paddle.
d. Spray-Head Assembly: Two receptor-mounted spray heads.
e. Receptor: stainless-steel or Plastic bowl.
f. Mounting: Attached shower pedestal.
g. Drench-Hose Option: May be provided instead of eyewash unit.

1) Capacity: Not less than 0.4 gpm for at least 15 minutes.
2) Drench Hose: Hand-held spray head with squeeze-handle actuator and hose.
3) Mounting: Bracket on shower pedestal.

2.2 SOURCE QUALITY CONTROL

A. Certify performance of emergency plumbing fixtures by independent testing organization acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.

B. Install fixtures level and plumb.

C. Fasten fixtures to substrate.

D. Install shutoff valves in water-supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

1. Exception: Omit shutoff valve on supply to group of plumbing fixtures that includes emergency equipment.
2. Exception: Omit shutoff valve on supply to emergency equipment if prohibited by authorities having jurisdiction.

E. Install dielectric fitting in supply piping to emergency equipment if piping and equipment connections are made of different metals. Comply with requirements for dielectric fittings specified in Section 221116 "Domestic Water Piping."

F. Install trap and waste piping on drain outlet of emergency equipment receptors that are indicated to be directly connected to drainage system. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."

G. Install indirect waste piping on drain outlet of emergency equipment receptors that are indicated to be indirectly connected to drainage system. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."

H. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 CONNECTIONS

A. Connect cold-water-supply piping to plumbed emergency plumbing fixtures not having water-tempering equipment. Comply with requirements for cold-water piping specified in Section 221116 "Domestic Water Piping."

B. Indirectly connect emergency plumbing fixture receptors without trapped drain outlet to sanitary waste or storm drainage piping.

C. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

3.4 FIELD QUALITY CONTROL

A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Emergency plumbing fixtures will be considered defective if they do not pass tests and inspections and shall be replaced at the cost to the contractor with a functioning system.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust or replace fixture flow regulators for proper flow.

END OF SECTION 224500

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SECTION 224713 - DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes drinking fountains and related components.

1.3 RELATED SECTIONS

A. Section Includes:
1. Section 220523 "General-Duty Valves for Plumbing Piping."
2. Section 220518 “Escutcheons for Plumbing Piping.”
3. Section 079200 "Joint Sealants."
4. Section 220719 "Plumbing Piping Insulation."
5. Section 221116 “Domestic Water Piping.”
6. Section 221316 “Sanitary Waste and Vent Piping.”

1.4 ACTION SUBMITTALS

A. Product Data: For each type of drinking fountain.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include operating characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For drinking fountains to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

A. Drinking Fountains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Elkay Manufacturing Company.
    b. Haws Corporation.
    c. Halsey Taylor.

2. Refer to Plumbing Schedule for Specification Standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use full-port ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball, gate, or globe shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.5 CLEANING

A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224713

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SECTION 230100 – MECHANICAL/ HVAC SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Division Section as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of Division 23 submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer’s and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Engineer’s final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for delivery.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer’s Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing and Project record drawings.

    a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Contractor shall execute a data licensing agreement in the form of Halff Associates’ Standard form.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section within a Construction Division concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
    - This submittal package shall be comprehensive document by Division and not piecemealed by specification section.
3. Submit action submittals and informational submittals required by the same Specification Section concurrent.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination. For example, **HVAC Equipment must be submitted and approved prior to approval of Electrical gear.**

a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals is indicated, allow 15 working days for initial review of each submittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
3. Include the following information for processing and recording action taken:

a. Project name.
b. Date.
c. Name of Engineer.
d. Name of Construction Manager, where applicable.
e. Name of Contractor.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Division Section or number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, initial submittal may serve as final submittal.

a. When paper copies are required, submit one copy of submittal.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return without review submittals received from sources other than Contractor.
    a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

        1) Project name.
        2) Date.
        3) Destination (To:).
        4) Source (From:).
        5) Name and address of Engineer.
        6) Name of Construction Manager, where applicable.
        7) Name of Contractor.
        8) Name of firm or entity that prepared submittal.
        9) Names of subcontractor, manufacturer, and supplier.
        10) Category and type of submittal.
        11) Submittal purpose and description.
        12) Specification Section number and title.
        13) Specification paragraph number or drawing designation and generic name for each of multiple items.
        14) Drawing number and detail references, as appropriate.
        15) Indication of full or partial submittal.
        16) Transmittal number, numbered consecutively.
        17) Submittal and transmittal distribution record.
        18) Remarks.
        19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item. Alternately, submit package as a comprehensive .pdf document by Division with each Specification Section tabbed.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Engineer.
    d. Name of Construction Manager, where applicable.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.

g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Specification paragraph number or drawing designation and generic name for each of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.
r. Other necessary identification.
s. Remarks.

F. Options: Identify options requiring selection by Engineer.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer’s action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer’s action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web site or FTP site specifically established for Project.

a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: For submittal formats 11 x 17 and larger, submit two paper copies of each submittal unless otherwise indicated in addition to the electronically posted submittal. Engineer will return one copy of paper submittal.
3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each construction Division and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data (8-1/2 x 11 format only) in the following format:

a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer, if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 11 x 17 but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
    a. Two opaque (bond) copies of each submittal. Engineer will return one copy. Submit also one electronic file for record keeping.

4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.

    a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
    b. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. "Samples for Verification" Subparagraph below can be used with or without Samples for initial selection. Revise to suit Project.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.

1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. After review, provide specification compliance form and mark with approval stamp before submitting to Engineer.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Submittals not required by the Contract Documents may be returned by the Engineer without action.

END OF SECTION 230100

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SECTION 230500 - MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Drawings and general previsions apply to this Section.

B. Examine all plans and specifications, visit the site(s) of the proposed project, and become fully informed as to the extent and character of the work required.

1.2 REQUIRED STANDARDS

A. Laws and Regulations of the State of Texas.

B. County of Hidalgo, City of Mercedes, codes and ordinances.

1.3 COORDINATION

A. Wind-Restraint Loading:

1. Basic Wind Speed: 136 MPH
2. Building Classification Category: II
   Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction. And 45 degrees either side of normal.

B. Delegated Design: Design roof mounted mechanical equipment supports to comply with the wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Texas, using performance requirements and design criteria required by the International Building Code for a continuous load path.

C. Coordinate work under this Division to avoid conflicts and to attain satisfactory and complementary systems.

D. Coordinate work under this Division with work under other Divisions to avoid conflicts and to allow for adequate installation, maintenance, and operating space. Obtain the Architect's approval for penetrations of other parts of the Work prior to effecting them.

E. In resolving pipe, duct and conduit coordination, meet all requirements and be guided by these general orders of precedence:

1. Accommodate gravity flow lines with required slopes before other lines.
2. Accommodate lines with specific slope requirements (i.e., steam and refrigerant gas) before other lines.
3. Accommodate work with a required reference elevation before other work.
4. Accommodate mains before branches.
5. Accommodate pipe and duct before conduit.
6. Accommodate large lines before small lines.
7. Accommodate pipe before duct.

8. Accommodate high-pressure and high-velocity duct before low-pressure and low-velocity duct.

F. Coordination of the work must occur between all project contractors and the requirements of access and priority shall be maintained regardless of the equipment installed “first.”In resolving pipe, duct, and conduit coordination, meet all requirements and be guided by these general orders of precedence.

1.4 DEFINITIONS

Specific meanings used in Division 23 (variant forms are inferred):

A. Work: This project, or the reference part.

B. Provide:

1. Furnish and install, complete with necessary appurtenances.
2. “Provide” is implied throughout this Division unless language is specific.

C. Required: Required by the contract Documents.

D. Necessary: Necessary in order to obtain a finished system in satisfactory operating condition, and meeting all requirements.

E. Furnish: Procure and deliver, ready for installation, necessary and/or required.

F. Install: Receive, place securely, ready for connection to work specified elsewhere, and bring into satisfactory operating condition, as necessary and/or required.

G. Connect: Connect properly to mechanical work. This includes non-physical “connections” such as indirect waste drains.

H. Architect, Project Architect or Architect/Engineer Team.

1.5 SCOPE OF WORK

A. The work under this Division includes providing complete mechanical systems for the project.

B. All items of labor, material or equipment not required in detail by the specifications or plans, but incidental to, or necessary for the complete installation and proper operation of all phases of work described herein, or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Contract Documents.

1.6 WORKMANSHIP

A. All labor shall be performed in a workmanlike manner by mechanics skilled in their particular trades. All installations shall be complete in both effectiveness and appearance whether finally enclosed or left exposed. The architect reserves the right to direct the removal or replacement

of any item which in his opinion shall not present a reasonable neat or workmanlike appearance, providing that same can be properly installed in an orderly way.

1.7 MANUFACTURER'S INSTRUCTIONS

A. Obtain written recommendations and installation and start-up instructions from material vendors and comply, unless otherwise required. Bring discrepancies between these instructions and project requirements to the attention of the Architect, and resolve prior to construction. Provide signed inspection report by manufacture's representative at system start-up to verify construction and warrantability.

1.8 OWNER'S INSTRUCTIONS

A. Provide training to the Owner in the operation of all systems and equipment. All such training shall be videotaped, and the Owner shall be provided two copies of this material in a DVD format at Owner's direction.

1.9 PERMITS AND FEES

A. Permits: Obtain special permits necessary for this portion of the Work.

B. Fees: Pay any fees associated with permits, required inspections, and permanent utility connections to this part of the work.

1.10 LICENSES

A. Work under this Division shall be performed by organizations and individuals holding a current license to perform such type of work by the authority having jurisdiction. "License" in this sense means any process, regardless of its appellation, which is normally mandated by the authority in order to perform such type of work within its jurisdiction.

B. In the event that the licensed organization loses its license or is unable to obtain one, or the licensed individual performing the work becomes unlicensed or deports the organization, notify Architect immediately in writing.

1.11 UTILITY COORDINATION

A. Permanent: In general, provide all ancillary work necessary to obtain utility connections. Pay connection fees. Arrange for connection in a timely manner. Coordinate time and arrangement of other work with the serving utility, and comply with utility standards.

B. Temporary: Refer to Division 1.

1.12 LISTING AND LABELING

Materials required to be listed shall be listed and labeled for the particular service if a listing is available. Obtain and comply with the terms of listings. Listed material include.

A. NSF: Potable water and sanitary waste systems components.

B. UL: Electrical materials.

C. AMCA: Air moving devices and related accessory items.

D. ARI: HVAC equipment.

E. FM or UL: Hazardous fluid and fire protection system components.

F. FIA, FM or AGA: Fuel gas system components.

1.13 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new. Products shall be currently manufactured.

B. All materials and equipment shall be clearly marked, stamped or labeled for identification. Do not obscure nameplates. Where manufactures nameplates do not meet the requirements of the mechanical identification specification provide nameplates in accordance with the specification.

C. All products of similar type shall be provided by a single manufacturer throughout the project.

1.14 SUBMITTALS AND REVIEW

A. Contractor shall furnish to the Architect, within a reasonable time after award of contract, and prior to commencing any work, complete brochures in quadruplicate (plus quantity required by the Contractor) of all materials and equipment which the contractor proposes to furnish on the project. Data shall include descriptive literature, performance data, diagrams, capacity information, etc., to substantiate that proposed equipment will meet all of the requirements of the plans and specifications.

B. All data must be checked and any required changes noted thereon by the contractor, signed and dated prior to furnishing same to the Architect for approval. Contractor’s attention is directed that it is mandatory that he thoroughly review data prior to furnishing same to assure that equipment is in accordance with plans and specifications and to assure prompt return of the data.

C. Deviations: Specifically call to the attention of the Architect every proposed deviation from the Contract Document requirements. Failure to identify deviations as such constitutes a representation that all requirements are not met.

D. Review: Review of submittals shall not be construed as releasing the Contractor from responsibility, but rather as a means to facilitate coordination of the work and the proper selection and installation of the products. All work shall be subject to final acceptance by the Architect at the completion of the project.

E. If above information is not provided complete as specified above and within the allocated time, all equipment shall be furnished exactly as specified without any substitutions.

1.15 SUBSTITUTIONS

A. Refer to the Conditions of the Contract.

B. Where one vendor is indicated for a product, it is to establish a level of quality and performance; provide a product equal to that product in all respects from a vendor of equivalent performance.

C. Where multiple vendors are indicated for a product, any of those vendors meeting the requirements may be submitted.

D. Some product specifications in this Division are of the Acceptable Manufacturer type. Vendors listed as Acceptable Manufacturers are acceptable as vendors. However, the product submitted is subject to review as being fully equivalent in detail to the basis of design.

E. Where multiple vendors are listed with product model numbers, each model and vendor is acceptable, provide all requirements are met. Model numbers are indicated to the extent believe necessary to identify a type and are not necessary completely.

F. The architectural/engineering team has designed the facility using requirements of the Basis of Design equipment. Any substitutions from the basis of design, which will require additional A/E design and/or coordination, shall include the cost of necessary redesign by professionals licensed in the respective disciplines and the approval of the professional of record.

1.16 DRAWINGS AND SPECIFICATIONS

A. These specifications are accompanied by Drawings. The Drawings and Specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both.

B. The Drawings are generally diagrammatic. Lay out work at the site to conform to existing conditions; architectural, structural, mechanical, and electrical conditions; to avoid all obstructions; and to conform to details of installation as required. Provide an integrated satisfactorily operating installation. All necessary offsets in piping, fittings, duct, etc., required to avoid interferences between piping, equipment, architectural, and structural elements shall be provided by the Contractor. Provide all necessary routing and offsets to avoid conflict.

C. Verify and arrange that sufficient space is provided for the installation of proposed products and that adequate access will exist for service and maintenance of equipment. For this work, adequate access shall be defined as meaning that service personnel can access and maintain a piece of equipment without having to alter permanent construction. Further, for equipment located above ceilings, access shall be available within 3 feet of ceiling opening or lay-in ceiling.

1.17 COMPLEMENTARY DOCUMENTS

A. Contract documents are complementary; requirements are not necessarily repetitively stated at each possible subject; consider that a requirement applies wherever applicable.

B. In the event of conflicting requirements in different parts of the Documents, the more expensive shall be presumed to apply, unless the Architect clarifies the requirement in a less expensive manner and waives the more expensive requirement in writing.

Since codes and standards are incorporated by reference, a particular conflict may appear in that a reference may use language that implies that a particular requirement in the Construction Documents is waived under the reference. This is not the case, unless specifically so clarified by the Architect. Generally, the specific Drawings and Specifications take precedence over waivers in multi-purpose reference documents.

C. Because of licensure and workmanship requirements, persons performing the work are presumed to be familiar with applicable codes, ordinances, laws, regulations and standards. Therefore, details of materials, methods, arrangements and size contained in such publications are not necessarily replicated in the Contract Documents. This in no way deletes the requirement of the Contractor to comply. In the event of an apparent conflict between such publications and the Contract Documents, request clarification from the Architect prior to construction.

1.18 REGULATORY MEETINGS

A. Comply with laws, rules and regulations, permit requirements, and ordinances. It is intended that the work of the Division be estimated and performed under the supervision of licensed master craftsman who are familiar with these requirements, whether illustrated or specifically detailed in the particular Contract Documents of this project or not. Therefore, regulatory requirements may not be so illustrated or detailed.

1.19 PROTECTION

A. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation. All materials and equipment shall be covered and protected against dirt, water, chemicals or mechanical injury.

1.20 CUTTING AND PATCHING

A. The work shall be carefully laid out in advance and the exact size and locations of openings arranged.

1.21 VIBRATION AND NOISE

A. Objectionable vibration and/or noise will not be tolerated.

1.22 DEMOLITION

A. Coordinate with other divisions before commencing work.

1.23 RECORD DOCUMENTS

A. Drawings: The Contractor shall maintain and update daily a set of "blueline" prints in the Field Office for the sole purpose of recording "installed" conditions. Revise the drawings to reflect as-built conditions, including all addenda, change orders, final shop drawing reviews, and field routing. Underground utilities shall be dimensionally located relative to readily accessible and identifiable permanent reference points, with accurate slope and elevation indicated. Submit prints for review. Revise, certify accuracy, and provide two final sets to the Architect.

B. Owner's Manual: Prior to final acceptance, provide two bound volumes to the Architect. Index by subject. Include corrected submittals and shop drawings that reflect final review comments; installation, operation and maintenance instructions, parts lists, wiring diagrams, and piping diagrams; warranties.

1.24 INSPECTION, OBSERVATION, AND TESTING

A. Cooperate with Architect's representative and authorities having jurisdiction. Provide complete access to the work at reasonable times.

B. Cover-up: Prior to covering up work, or conducting observed tests, request observation as appropriate. Provide adequate advance notice defined as a minimum of five working days. In some cases the Architect's representative may waive observation; otherwise arrange for observed construction and testing prior to cover-up. Should the minimum required notice not be provided and the contractor covers up work requiring observation, such work shall be uncovered at contractor's expense.

C. Pre-Testing: Self-inspect, pre-test, and remedy work prior to performing observed test.

D. Sectional Work: In circumstances where a requirement for phased construction or other considerations dictate sectional construction and/or testing, notify the Architect when construction begins on the first section of a system, and when the first section will be ready for observed testing, as well as subsequent sections. Test in the largest practical sections.

1.25 WORK PERFORMED UNDER OTHER DIVISIONS

A. Refer to Division 2 for piped utilities beyond 5 feet from the building.

B. Refer to Division 26 for power wiring systems external to equipment and control panels; starters in motor centers; safety switches not integral to equipment or starters provided under Division 23.

C. Refer to Division 14 for kitchen, laboratory, medical and like equipment.

1.26 REFERENCE TO OTHER DIVISIONS

A. Refer to Division 26 for additional material requirements of electrical components provided under Division 23, such as loose starters, wiring and devices integral to equipment.

B. Refer to Division 2 for additional requirements governing excavation and backfill, supplemental to the requirements stated in this Division 23.

C. Comply with all requirements applicable to work required under this Division.

1.27 TESTING SERVICES

A. Additional Testing: In addition to any specified testing, the Architect may cause additional testing to be performed by an independent testing laboratory or any other qualified party. If such testing reveals deficient work by the Contractor, the Contractor shall pay for both the testing and remedial work. If such testing does not reveal deficient work by the Contractor, the Owner shall pay for the testing and the cost of repairing any damage caused by such testing.

B. Specified Testing Services: If independent testing services are specified regarding work under this Division, cooperate fully with the testing agency. Provide access to the work. Provide test holes and taps necessary. Remove work that is not tested on site, deliver to testing agency, and reinstall if undamaged; replace if damaged. Provide utilities, operational capability, and facilities for on-site testing as necessary.

1.27 WORK BY OWNER

A. The owner will award contracts on work which includes:

1. None.

1.28 OWNER FURNISHED PRODUCTS

A. Products furnished to the site and paid for by the Owner.

1. None.

END OF SECTION 230500

SECTION 230510 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Mechanical demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

B. RELATED SECTIONS
1. Section “Sheet Metal Flashing and Trim” for flashing.
2. Section “Joint Sealants”
3. Section “Through-Penetration Firestop Systems” for materials.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. PE: Polyethylene plastic.
2. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified, at no cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:
1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
2. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. JCM Industries.
d. Smith-Blair, Inc.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Available Manufacturers:

a. NIBCO INC.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psigminimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type with spring clips.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and set screw.
g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.
h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.

b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Alteration of permanent construction is not acceptable. For equipment above hard ceilings, provide access panels. For all equipment above ceilings, access shall be available within three feet of ceiling opening or lay-in tile. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9 Section "Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."
8. Provide 6” high bases for air handling units and 4” bases for other equipment.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.10 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 230510

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

B. Related Sections:

1. Division 07 Section 079200 "Joint Sealants."
2. Division 07 Section 078413 "Penetration Firestopping."
3. Division 07 Section 076200 "Sheet Metal Flashing and Trim."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6 Sleeve-seal fittings.
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6 Galvanized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

    a. Piping Smaller Than NPS 6 Galvanized-steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

    a. Piping Smaller Than NPS 6 Stack-sleeve fittings.
    b. Piping NPS 6 and Larger: Stack-sleeve fittings.

5. Interior Partitions:

    a. Piping Smaller Than NPS 6 Galvanized-steel-pipe sleeves or PVC-pipe sleeves
    b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 230517

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SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with rough-brass finish.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with rough-brass finish.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: Split-casting brass type with rough-brass finish.
f. Bare Piping in Equipment Rooms: Split-casting brass type with rough-brass finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials at cost to the contractor.

END OF SECTION 230518

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SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 23 Section "Vibration Controls for HVAC Piping and Equipment" for vibration isolation devices.
3. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper B-Line, Inc.
    b. Flex-Strut Inc.
    c. Hayden Corp.
    d. Powerstrut Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allied Tube & Conduit.
    b. Anvil International; a subsidiary of Mueller Water Products Inc.
    c. Empire Industries, Inc.
    d. ERICO International Corporation.
    e. GS Metals Corp.
    f. NIBCO INC.
    g. PHD Manufacturing, Inc.
    h. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Hot dipped galvanized.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Low Type Pipe Stand (For Single Pipes ≤ 2 1/2" in diameter): Plastic base unit with galvanized steel rods and roller to support pipe, for roof installation without membrane penetration. Product to equal to Portable Pipe Hanger #SS8-R.

C. High-Type, Single-Pipe Stand (For Pipes > 2 1/2” in diameter):

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Plastic.
3. Vertical Members: Two HDG-steel channels.
4. Horizontal Member: HDG-steel channel.
5. Rod/Hanger: HDG continuous thread rod and clevis hanger.
6. Product equal to PPH #PS-1-2.

D. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: Plastic.
3. Vertical Members: Two or more HDG-steel channels.
4. Horizontal Member: HDG-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers, and continuous thread rod.
6. Product equal to PPH #PSE-2-2.

E. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface with use of isolation pad. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use coated carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.

F. Use padded hangers for piping that is subject to scratching.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
7. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
8. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
9. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
10. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
11. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
12. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
13. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

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SECTION 230548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Isolation mounts.
2. Freestanding and restrained spring isolators.
3. Spring hangers.
4. Spring hangers with pre-compression.
5. Pipe riser resilient supports.
6. Resilient pipe guides.
7. Inertia, vibration isolation equipment bases.

B. Related Sections:

1. Division 22 Sections for equipment mounted outdoors.

2. Division 07 Section “Roof Accessories” for installation of roof curbs, equipment supports, and roof penetrations.

3. Division 01 Section “Demonstration and Training”.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

B. Delegated-Design Submittal: For vibration isolation details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, wind forces required to select vibration isolators, wind restraints, and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.

2. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

C. Welding certificates.

D. Qualification Data: For professional engineer under delegated designs requirements.

E. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated in this specification or a comparable product by one of the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Mason Industries.
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation.
6. Vibration Mountings & Controls, Inc.

B. Mounts (Mason Industries #ND): Double-deflection type, with molded, neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with

baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range. Select with minimum deflection of 0.35" for application.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

C. Spring Isolators (Mason Ind. #SLF): Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, neoprene isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

D. Restrained Spring Isolators (Mason Ind. #SLR): Freestanding, steel, open-spring isolators with limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

E. Spring Hangers (Mason Ind. #30N): Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, neoprene minimum 1-1/4" thick. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

F. Spring Hangers with Pre-Compression (Mason Ind. #PC30N): Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with spring pre-compressed and locked at rated compression until installation is complete.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

G. Pipe Riser Resilient Support (Mason Ind. #ADA): All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

H. Resilient Pipe Guides (Mason Ind. #VSG): Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of 1-5/8" motion or to meet location requirements.

2.2 VIBRATION ISOLATION EQUIPMENT BASES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated in this specification or a comparable product by one of the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Mason Industries.
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation.
6. Vibration Mountings & Controls, Inc.

B. Inertia Base (Mason Ind. #K): Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and wind-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Install Vibration control devices in accordance with schedule herein.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

C. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

E. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

G. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Test to 90 percent of rated proof load of device.
3. Measure isolator restraint clearance.
4. Measure isolator deflection.
5. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust air-spring leveling mechanism.

D. Adjust active height of spring isolators.

E. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems. Refer to Division 01 Section "Demonstration And Training."

3.7 HVAC VIBRATION-CONTROL DEVICE SCHEDULE

A. Fan-Coil Units/Air Handling Units/Exhaust Fans

1. Equipment Location: Suspended.
2. Isolator Type: Spring Hanger.
3. Minimum Deflection.
   a. Thru 5hp: 0.75."
   b. 7 1/2hp and greater: 1.5."

B. Air Handling Units

1. Equipment Location: Floor.
2. Isolator Type: Isolation Mount.
3. Minimum Deflection:0.35."

C. Utility Sets

1. Equipment Location: Roof-top.
2. Isolator Type: Restrained Spring Isolator.
3. Minimum Deflection
   a. Fan speeds over 500rpm: 1.5."
   b. Fan speeds below 500rpm: 2.5."
4. Set/Isolator shall be mounted on roof cant(s).

END OF SECTION 230548

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SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch Stainless steel, 0.025-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/2 inch for name of units for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/2 inch name of units for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/2 inch for name of units for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. General Requirements for Manufactured Duct Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Duct Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.5 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/2 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.

2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.6 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch, Stainless steel, 0.025-inchor anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting"

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Pipe Label Color Schedule:

1. Refrigerant Piping:

a. Background Color: Green.
b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

    a. Refrigerant: 1-1/2 inches round.
    b. Hot Water: 1-1/2 inches round.
    c. Gas: 1-1/2 inches round.

2. Valve-Tag Color:

    a. Refrigerant: Natural.
    b. Hot Water: Natural.
    c. Gas: Natural.

3. Letter Color:

    a. Refrigerant: Black.
    b. Hot Water: Black.
    c. Gas: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
    a. Variable-air-volume systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 ACTION SUBMITTALS

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 45 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. TAB Conference: Meet with General Contractor and HVAC Engineer (and, if applicable Commissioning Authority) on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.8 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Refrigerant systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance variable-air-volume systems the same as described for constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.

5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.

5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.10 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.11 TOLERANCES

A. Set HVAC system's air flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

3.12 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.13 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.

9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

    a. Total air flow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Filter static-pressure differential in inches wg.
    f. Preheat-coil static-pressure differential in inches wg.
    g. Cooling-coil static-pressure differential in inches wg.
    h. Heating-coil static-pressure differential in inches wg.
    i. Outdoor airflow in cfm.
    j. Return airflow in cfm.
    k. Outdoor-air damper position.
    l. Return-air damper position.
    m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch o.c.
    f. Make and model number.
    g. Face area in sq. ft.
    h. Tube size in NPS.
    i. Tube and fin materials.
    j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Average face velocity in fpm.
    c. Air pressure drop in inches wg.
    d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
    e. Return-air, wet- and dry-bulb temperatures in deg F.
    f. Entering-air, wet- and dry-bulb temperatures in deg F.
    g. Leaving-air, wet- and dry-bulb temperatures in deg F.
    h. Water flow rate in gpm.
    i. Water pressure differential in feet of head or psig.

j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.

b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Air flow rate in cfm.
i. Face area in sq. ft.
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Air flow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

L. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.14 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

    a. Measure airflow of at least 10 percent of air outlets.
    b. Measure water flow of at least 5 percent of terminals.
    c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    d. Verify that balancing devices are marked with final balance position.
    e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made Engineers.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Project HVAC Engineer.
3. HVAC engineer randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.15 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

C. T & B contractor shall include 16 hours of time dedicated to verification of final Test and Balance Report. This shall be done on-site, with instruments, and in the presence of the Commissioning Agent (Cx). Cx shall require random system testing. If more than 10% of tests are beyond reported value tolerances. The entire report is subject to re-test in its entirety.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return and exhaust located in unconditioned space.
4. Indoor, exposed return and exhaust located in unconditioned space.
5. Outdoor, concealed supply and return.
6. Outdoor, exposed supply and return.

B. Related Sections:

1. Division 23 Section "HVAC Equipment Insulation."
2. Division 23 Section "HVAC Piping Insulation."
3. Division 23 Section "Metal Ducts" for duct liners.
4. Division 07 Section “Penetration Firestopping.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

C. Qualification Data: For qualified Installer.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Sheet, K-Flex Gray Duct Liner, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290 Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.
b. Johns Manville; 800 Series Spin-Glas.
c. Knauf Insulation; Insulation Board.

d. Manson Insulation Inc.; AK Board.
e. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; FlameChek.
b. Johns Manville; Firetemp Wrap.
c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
d. Thermal Ceramics; FireMaster Duct Wrap.
e. 3M; Fire Barrier Wrap Products.
f. Unifrax Corporation; FyreWrap.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc.; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc.; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc.; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc.; 85-50.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 739, Dow Silicone.
    b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    c. P.I.C. Plastics, Inc.; Welding Adhesive.
    d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc; CP-30.
    b. Eagle Bridges - Marathon Industries; 501.
    c. Foster Brand, Specialty Construction Brands, Inc.; 30-35.
    d. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; Encacel.
    b. Eagle Bridges - Marathon Industries; 570.
    c. Foster Brand, Specialty Construction Brands, Inc.; 60-95/60-96.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-50 AHV2.
    b. Foster Brand, Specialty Construction Brands, Inc.; 30-36.
    c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-76.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc.; 95-44.
    d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc.; Chil-Glas No. 5.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc.; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.

D. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: 1-mil thick, heat-bonded polyethylene and kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.

2.11 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 491 AWF FSK.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    c. Compac Corporation; 110 and 111.
    d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 370 White PVC tape.
    b. Compac Corporation; 130.
    c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 488 AWF.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    c. Compac Corporation; 120.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; CD.
3) Midwest Fasteners, Inc.; CD.
4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CHP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
2) GEMCO; Peel & Press.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

5. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) AGM Industries, Inc.; RC-150.
        2) GEMCO; R-150.
        3) Midwest Fasteners, Inc.; WA-150.
        4) Nelson Stud Welding; Speed Clips.

    b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. C & F Wire.

2.13 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

B. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240, Type 304 or Type 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping"firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface.

Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and

inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.9 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return and exhaust located in unconditioned space.
4. Indoor, exposed return and exhaust located in unconditioned space.
5. Outdoor, concealed supply and return.
6. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, round and flat-oval, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

E. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

F. Concealed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

G. Concealed, rectangular, outdoor-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

H. Concealed, rectangular, exhaust-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

I. Concealed, supply-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

J. Concealed, return-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

K. Concealed, outdoor-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

L. Concealed, exhaust-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

M. Exposed, round and flat-oval, supply-air duct insulation shall be the following:

1. Pre-insulated double-wall duct.

N. Exposed, round and flat-oval, return-air duct insulation for non-conditioned spaces shall be the following:

1. Pre-insulated double-wall duct.

O. Exposed, round and flat-oval, outdoor-air duct insulation shall be the following:

1. Pre-insulated double-wall duct.

P. Exposed, round and flat-oval, exhaust-air duct insulation shall be the following:

1. Pre-insulated double-wall duct.

Q. Exposed, rectangular, supply-air duct insulation shall be the following:

1. Insulated double-wall duct.

R. Exposed, rectangular, return-air duct insulation for non-conditioned spaces shall be the following:

1. Insulated double-wall duct.

S. Exposed, rectangular, outdoor-air duct insulation shall be the following:

1. Insulated double-wall duct.

T. Exposed, rectangular, exhaust-air duct insulation shall be the following:

1. Insulated double-wall duct.

U. Exposed, supply-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

V. Exposed, return-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

W. Exposed, outdoor-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

X. Exposed, exhaust-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

3.13 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Concealed, round and flat-oval, supply-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

C. Concealed, round and flat-oval, return-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

D. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

E. Concealed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

F. Concealed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

G. Concealed, supply-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

H. Concealed, return-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

I. Exposed, round and flat-oval, supply-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

J. Exposed, round and flat-oval, return-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

K. Exposed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

L. Exposed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

M. Exposed, supply-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

N. Exposed, return-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density. Encapsulate insulation with FlexClad 400, or approved equal, protective system.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:

1. None.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. Flex Clad 400.

D. Ducts and Plenums, Exposed:

1. Flex Clad 400.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping.
2. Refrigerant suction and hot-gas piping.

B. Related Sections:

1. Section 230713 "Duct Insulation."
2. Section 230716 "HVAC Equipment Insulation."
3. Section 232113.13 "Underground Hydronic Piping" for loose-fill pipe insulation in underground piping outside the building.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pittsburgh Corning Corporation; Foamglas.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johns Manville; Micro-Lok.
    b. Knauf Insulation; 1000-Degree Pipe Insulation.
    c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; CrimpWrap.
    b. Johns Manville; MicroFlex.
    c. Knauf Insulation; Pipe and Tank Insulation.
    d. Manson Insulation Inc.; AK Flex.
    e. Owens Corning; Fiberglas Pipe and Tank Insulation.

J. Phenolic:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Kingspan Tarec Industrial Insulation NV; Koolphen K.
    b. Resolco International BV; Insul-phen.

2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
5. Factory-Applied Jacket: Requirements are specified in "Factory-Applied Jackets" Article.

    a. Preformed Pipe Insulation: ASJ.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Foster Brand, Specialty Construction Brands, Inc.; 81-84.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-96.
    b. Foster Brand, Specialty Construction Brands, Inc.; 81-33.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA, Inc.; Aeroseal.
    b. Armacell LLC; Armaflex 520 Adhesive.
    c. Foster Brand, Specialty Construction Brands, Inc.; 85-75.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc.; CP-127.
   b. Foster Brand, Specialty Construction Brands, Inc.; 85-60/85-70.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc.; CP-82.
   b. Foster Brand, Specialty Construction Brands, Inc.; 85-50.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Dow Corning Corporation; 739, Dow Silicone.
   b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc.; 30-80/30-90.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F.
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc.; CP-50 AHV2.
b. Foster Brand, Specialty Construction Brands, Inc.; 30-36.
c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.

4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-76.
    b. Foster Brand, Specialty Construction Brands, Inc.; 30-45.
    c. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: Gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc.; CP-76.
    b. Foster Brand, Specialty Construction Brands, Inc.; 95-44.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene or polypropylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
6. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. FSP Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with polyethylene or polypropylene jacketing.

D. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

E. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

a. Sheet and roll stock ready for shop or field sizing.
b. Material, finish, and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.

2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Width: 3 inches.
2. Film Thickness: 4 mils.
3. Adhesive Thickness: 1.5 mils.
4. Elongation at Break: 145 percent.
5. Tensile Strength: 55 lbf/inch in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Width: 3 inches.
2. Film Thickness: 6 mils.
3. Adhesive Thickness: 1.5 mils.
4. Elongation at Break: 145 percent.
5. Tensile Strength: 55 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 316; 0.015 inch thick, 3/4 inch wide with closed seal.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe

insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.10 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK or FSP jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.

4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch-circumference limit allows for 2-inch-overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.11 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 3/4 inch thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 1 inch thick.

C. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 1 inch thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 2 inches thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 2 inches thick.

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. FSP-factory.

D. Piping, Exposed:

1. PVC: 20 mils thick.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. PVC: 20 mils thick.

D. Piping, Exposed:

1. Aluminum, Smooth 0.020 inch thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 230719

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SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 RELATED SECTIONS

A. Division 07 Section “Roof Accessories.”

B. Division 07 Section “Access Doors and Frames”

C. Division 23 Section “Identification for HVAC Piping and Equipment”

D. Division 23 Section “Sleeves and Sleeve Seals for HVAC Piping.

E. Division 23 Section “Escutcheons for HVAC Piping”

1.4 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: 1/8 inch equals 1 foot.
2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.9 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.10 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K , L, or ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.

B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.

C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Flanged Unions:

1. Body: Forged-steel flanges for NPS 1 to NPS 1-1/2 and ductile iron for NPS 2 to NPS 3. Apply rust-resistant finish at factory.
2. Gasket: Fiber asbestos free.
3. Fasteners: Four plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
5. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
6. Pressure Rating: Factory test at minimum 400 psig.
7. Maximum Operating Temperature: 330 deg F.

F. Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
2. End Connections:

   a. NPS 2 and Smaller: With threaded-end connections.
   b. NPS 2-1/2 and Larger: With flanged-end connections.

3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24 V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

F. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F .
6. Superheat: Nonadjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig.

G. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

H. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.

6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-22: Monochlorodifluoromethane.

D. ASHRAE 34, R-134a: Tetrafluoroethane.

E. ASHRAE 34, R-407C: Difluoromethane/Pentafluoroethane/1,1,1,2-Tetrafluoroethane.

F. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

D. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

E. Safety-Relief-Valve Discharge Piping: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

F. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

G. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valveConsult refrigeration equipment manufacturer to determine the need for a receiver.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Contact Engineer-of-Record and refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:

1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.

2. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
3. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
4. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.

E. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work. Scale: 1/4" =1'-0".
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to 1/4" = 1' -0" scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

B. Welding certificates.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.

10. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
12. Service: Indoor or outdoor.
13. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with the latest edition of SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 1-1/2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 1- 1/2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 1-1/2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 1-1/2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with the latest edition of SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 95 percent of total installed duct area for each designated pressure class.
    b. Return Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 95 percent of total installed duct area for each designated pressure class.
    c. Exhaust Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections totaling no less than 95 percent of total installed duct area for each designated pressure class.
    d. Outdoor Air Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 95 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give five days' advance notice for testing.

3.8 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Laboratory fume-hood: Stainless steel.

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units (Downstream):

    a. Pressure Class: Positive 1-inch wg.
    b. Minimum SMACNA Seal Class: Unconditioned – B. Conditioned-C.

2. Ducts Connected to Constant-Volume Air-Handling Units:

    a. Pressure Class: Positive 1-inch wg.

b. Minimum SMACNA Seal Class: Unconditioned – B. Conditioned-C.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 1-inch wg.
b. Minimum SMACNA Seal Class: Unconditioned – B. Conditioned-C.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: Unconditioned – B. Conditioned-None.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 1 inch wg.
b. Minimum SMACNA Seal Class: Unconditioned – B. Conditioned-None.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: Unconditioned – B. Conditioned-None.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg.
b. Minimum SMACNA Seal Class: C.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units

a. Pressure Class: Positive or negative 1-inch wg
b. Minimum SMACNA Seal Class: C.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: C

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

2. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Match duct material.

3. Aluminum Ducts: Aluminum.

G. Elbow Configuration:

1. Rectangular Duct: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or lower:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Mitered Type RE 2 with vanes complying with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows." Type RE2 to be used only when types RE1 and RE3 are not physically allowed. Mitered elbows are only to be used on 90° angles and only when type RE1 fittings cannot be used.
3) Square throat, radius heel elbows will not be allowed under any circumstances.

b. Velocity 1000 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows." Type RE2 to be used only when types RE1 and RE3 are not physically allowed. Mitered elbows are only to be used on 90° angles and only when type RE1 fittings cannot be used.
3) Square throat, radius heel elbows will not be allowed under any circumstances.

2. Round Duct: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
1) Velocity 1000 fpm or lower: 1.0 centerline radius-to-diameter ratio and four segments for 90-degree elbow.

2) Velocity 1000 fpm or Higher: 1.5 centerline radius-to-diameter ratio and five segments for 90-degree elbow.

b. Round Elbows, 12 Inchesd Smaller in Diameter: Stamped, gored or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam, gored or Welded.

H. Branch Configuration:

1. Rectangular Duct: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch under 1000 fpm: Spin in.
c. Rectangular Main to Round Branch over 1000 fpm: Conical Spin in or 45-degree entry.

2. Round and Flat Oval: Comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: Conical tap.
b. Velocity 1000 fpm or Higher: 45-degree lateral, 45-degree entry tap or conical tap with 4-inch larger base than tap.

END OF SECTION 233113

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SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Counter balanced backdraft dampers.
3. Manual volume dampers.
4. Control dampers.
5. Fire dampers.
6. Ceiling radiation dampers.
7. Combination fire and smoke dampers.
8. Flange connectors.
9. Duct silencers.
10. Remote damper operators.
11. Duct-mounted access doors.
12. Flexible connectors.
13. Flexible ducts.
14. Duct security bars.
15. Duct accessory hardware.

B. Related Requirements:

1. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Section 283111 "Digital, Addressable Fire-Alarm System" for duct-mounted fire and smoke detectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

    a. Special fittings.
    b. Manual volume damper installations.
    c. Control-damper installations.
    d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
    e. Duct security bars.
    f. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to 1/4"=1'-0"scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480 Type 304, and having a No. 2 finish for concealed ducts and No. 4D finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin# S3G or comparable product by one of the following:
1. Cesco Products.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 3000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 20 gauge, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, end pivoted, maximum 4-inch width, 28 guage galvanized steel with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:

1. Material: Nonmetallic up to 42" wide. O/W, stainless steel.

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.

2.4 COUNTERBALANCED BACKDRAFT DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin # CBD2 or comparable product by one of the following:
1. Cesco Products.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.

B. Suitable for horizontal or vertical mounting.

C. Maximum Air Velocity: 1000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 0.090-inch thick extruded aluminum with welded corners or mechanically attached and mounting flange.

F. Blades:

1. Multiple, 0.025-inch thick, roll-formed aluminum.
2. Maximum Width: 6 inches.
3. Action: Parallel.
4. Balance: Gravity.
5. Eccentrically pivoted.

G. Blade Seals: Vinyl.

H. Tie Bars and Brackets:

1. Material: Aluminum.
2. Rattle free with 90-degree stop.

I. Counterbalance: Zinc plated steel weights.

J. Bearings: Synthetic.

K. Accessories:

1. Flange on intake.
2. Adjustment device for setting varying differential static pressures adjustable to 0.01"wg.

2.5 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin #MD25 (rectangular) or #MDRS25 (round) or comparable product by one of the following:
      a. Flexmaster U.S.A., Inc.
      b. Nailor Industries Inc.

   2. Standard leakage rating, with linkage outside airstream.
   3. Suitable for horizontal or vertical applications.
   4. Frames:

      a. Frame: Hat-shaped, 20 gauge, galvanized sheet steel.
      b. Mitered corners.
      c. Flanges for attaching to walls and flangeless frames for installing in ducts.

   5. Blades:

      a. Multiple or single blade.
      b. Parallel- or opposed-blade design.
      c. Galvanized-steel, 20 gauge.

   6. Blade Axles: Galvanized steel.
   7. Bearings:

      a. Molded synthetic.
      b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

   8. Tie Bars and Brackets: Galvanized steel.

2.6 CONTROL DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin #CD35 or comparable product by one of the following:
   1. Cesco Products
   2. Greenheck Fan Corporation.
   3. Nailor Industries Inc.

B. Frames:

   1. Hat shaped.
   2. 16 inch galvanized sheet steel.
   3. Interlocking, gusseted corners.

C. Blades:

   1. Multiple blade with maximum blade width of 6 inches.
   2. Parallel- and opposed-blade design.

3. Galvanized-steel.
4. 16 gauge single skin.
5. Blade Edging: Closed-cell neoprene rated for 10CFM leakage per sq. ft at 1" wg.

D. Blade Axles: 1/2-inch diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:

1. Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.7 FIRE DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin #IBD2 (1-1/2hr, rectangular), #FDR25 (1-1/2 hour, round), #IBD2-B3 (3hour, rectangular) or comparable product by one of the following:
1. Cesco Products.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.

B. Type: Static; rated and labeled according to UL 555 by an NRTL.

C. Fire Rating: 1-1/2 and 3 hours.

D. Frame: fabricated with roll-formed, 20 gauge thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory installed, galvanized sheet steel.

1. Minimum Thickness: 20 gauge thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: 24 gauge curtain type.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

J. Access Door: Factory installed in sleeve.

2.8 CEILING RADIATION DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin # CFD3 (rectangular), #CFDR3 (round) or comparable product by one of the following:
   1. Cesco Products.
   2. Nailor Industries Inc.

B. General Requirements:

   1. Labeled according to UL 555C by an NRTL.
   2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.

E. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

F. Fire Rating: 3 hours.

2.9 COMBINATION FIRE AND SMOKE DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ruskin #FSD35 (1-1/2 hr, rectangular), #FSDR35 (1-1/2 hr, round), #FSD60-3 (3 hr, rectangular), or comparable product by one of the following:
   1. Cesco Products.
   2. Greenheck.
   3. Nailor Industries.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Hat-shaped, 16 gauge, galvanized sheet steel, with interlocking, gusseted corners and mounting flange.

F. Heat-Responsive Device: Replaceable 165 deg F rated, fusible links.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Blades: Roll-formed, horizontal, overlapping, 16 gauge galvanized sheet steel.

I. Leakage: Class III.

J. Rated pressure and velocity to exceed design airflow conditions.

K. Mounting Sleeve: Factory-installed, 20 gauge, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

L. Damper Motors: two-position action.

M. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Direct Digital Controls,
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
7. Electrical Connection: 115 V, single phase, 60 Hz.

2.10 FLANGE CONNECTORS

A. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

B. Material: Galvanized steel.

C. Gage and Shape: Match connecting ductwork.

2.11 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Roto-twist.
2. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Copper.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed.

F. Wall-Box Cover-Plate Material: Stainless steel.

2.12 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
   1. Cesco Products.
   2. Ductmate Industries, Inc.
   3. Flexmaster U.S.A., Inc.
   4. Greenheck Fan Corporation.
   5. Nailor Industries Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

   1. Door:

      a. Double wall, rectangular.
      b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
      c. Vision panel.
      d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
      e. Fabricate doors airtight and suitable for duct pressure class.

   2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
   3. Number of Hinges and Locks:

      a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
      b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
      c. Access Doors up to 24 by 48 Inches: Three hinges Continuous and two compression latches with outside and inside handles.
      d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

2.13 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.

B. Coatings and Adhesives: Comply with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 22 gauge galvanized sheet steel or 20 gauge aluminum sheets. Provide metal compatible with connected ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

   1. Minimum Weight: 26 oz./sq. yd.
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.14 FLEXIBLE DUCTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Flexmaster #8M or comparable product by one of the following:
1. McGill AirFlow LLC.

B. The duct shall be constructed of a CPE fabric supported by helical wound galvanized steel. The fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals.

C. The internal working pressure rating shall be at least 6" w.g. positive and 4" w.g. negative with a bursting pressure of at least 2 ½ time the working pressure

D. The duct shall be rated for a velocity of at lease 4000 feet per minute.

E. The duct must be suitable for continuous operation at a temperature range of -20° F to +250° F.

F. Acoustical performance, when tested by an independent laboratory in accordance with the Air Diffusion Council's Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties, shall be as follows:

1. The insertion loss (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	7	31	40	38	40	27
8" diameter	13	29	36	35	38	22
12" diameter	21	28	29	33	26	12

2. The radiated noise reduction (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	5	8	7	8	11	15
8" diame-	10	7	7	8	10	13

ter						
12" diame-ter	9	6	6	5	9	13

3. The self generated sound power levels (LW) dB re 10^{-12} Watt of a 10 foot length of straight duct for an empty sheet metal duct when tested in accordance with ASTM E477, at a velocity of 1000 feet per minute, shall not exceed:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diame-ter	42	31	23	18	17	21
8" diame-ter	41	34	27	19	18	21
12" diame-ter	54	45	38	31	27	23

G. Factory insulate the flexible duct with fiberglass insulation. Provide insulation as required by ASHRAE 90.1.

H. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM #96, Procedure A.

I. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

2.15 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire dampers according to UL listing.

H. Install duct security bars. Construct duct security bars from 0.164-inchsteel sleeve, continuously welded at all joints and 1/2-inch diameter steel bars, 6 inches o.c. in each direction in center of sleeve. Weld each bar to steel sleeve and each crossing bar. Weld 2-1/2-by-2-1/2-by-1/4-inch steel angle to 4 sides and both ends of sleeve. Connect duct security bars to ducts with flexible connections. Provide 12-by-12-inch hinged access panel with cam lock in duct in each side of sleeve.

I. Connect ducts to duct silencers with flexible duct connectors rigidly.

J. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. Upstream or downstream from duct silencers.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

K. Install access doors with swing against duct static pressure.

L. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.

2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

M. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

N. Install flexible connectors to connect ducts to equipment.

O. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

Q. Connect diffusers or light troffer boots to ducts with maximum 72 inches lengths of flexible duct clamped or strapped in place.

R. Connect flexible ducts to metal ducts with draw bands.

S. Install duct test holes where required for testing and balancing purposes.

T. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.
2. Ceiling-mounted ventilators.
3. In-line centrifugal fans.

B. Related Sections:

1. Section 230513 " Common Motor Requirements for HVAC Equipment.
2. Section 230548 "Vibration Controls for HVAC Piping and Equipment."
3. Section 033000 "Cast-in-Place Concrete."
4. Section 230553 "Identification for HVAC Piping and Equipment."
5. Section 233300 "Air Duct Accessories."
6. Section 260526 "Grounding and Bonding for Electrical Systems."
7. Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
8. Section 230593 "Testing, Adjusting, and Balancing for HVAC"

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to 1/4" = 1'-0" scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS-DIRECT DRIVE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.

B. Housing: Galvanized steel with integral inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent on direct drive units.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
5. Provide auto belt tensioner for belt drive units.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300,

"Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using spring isolators having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548 "Vibration Controls for HVAC Piping and Equipment."

1. Secure vibration controls to concrete bases using anchor bolts cast in concrete base.

C. Install floor-mounted units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

E. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

F. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548 "Vibration Controls for HVAC Piping and Equipment."

G. Install units with clearances for service and maintenance.

H. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 233423

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SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Round Ceiling diffusers.
2. Rectangular and square ceiling diffusers.
3. Linear slot diffusers.
4. Adjustable bar registers and grilles.

B. Related Sections:

1. Section 089000 "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to 1/4" = 1'-0" scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Round Ceiling Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Nailor Industries Inc.
   b. Price Industries.
   c. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, white unless otherwise scheduled.
5. Face Style: as scheduled.
6. Mounting: Duct connection.
7. Pattern: Fully adjustable.
8. Dampers: None.
9. Accessories: As scheduled.

B. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Nailor Industries Inc.
   b. Price Industries.
   c. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, white unless otherwise specified.
5. Face Size: 24 by 24 inches for layin and surface-mount by 12 inches
6. Face Style: cone or Plaque. Refer to schedule.
7. Mounting: Surface T-bar. Refer to schedule.
8. Pattern: Fixed.
9. Dampers: None.
10. Accessories: As scheduled.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Bar and slot Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Nailor Industries Inc.

b. Price Industries.
c. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: As scheduled.
5. Frame: As scheduled.
6. Mounting Frame: As scheduled.
7. Damper Type: None.
8. Accessories: As scheduled.

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Nailor Industries Inc.
   b. Price Industries.
   c. Titus.

2. Material: Aluminum.
3. Finish: Baked enamel, white unless otherwise scheduled.
4. Face Blade Arrangement: As scheduled.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: As scheduled.
7. Frame: 1-1/4 inches wide.
8. Mounting: As scheduled.
9. Damper Type: None.

B. Adjustable Bar Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Nailor Industries Inc.
   b. Price Industries.
   c. Titus.

2. Material: Aluminum.
3. Finish: Baked enamel, white unless otherwise scheduled..
4. Face Blade Arrangement: As scheduled.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: As scheduled.
7. Frame: 1-1/4 inches.
8. Mounting: As scheduled.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

B. Related Sections:

1. Section 033000 "Joint Sealants."
2. Section 230513 “Common Motor Requirements for HVAC Equipment”
3. Section 230900 “Instrumentation and Control for HVAC”
4. Section 230993 “Sequence and Operations for HVAC Controls"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals, owner training, and warranty certificates.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each air-handling unit.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.

b. For Parts: Fiveyear(s) from date of Substantial Completion.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation;
2. Daikin
3. Mitsubishi.
4. Trane.

2.2 INDOOR UNITS

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Enclosure Type: Totally enclosed, fan cooled.
    d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
    f. Mount unit-mounted disconnect switches on interior of unit.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Condensate Drain Pans:

a. Fabricated with minimum one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
2) Depth: A minimum of 1 inch deep.

b. Single-wall, stainless-steel sheet.
c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 1.

d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

8. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

b. Disposable Panel Filters:

1) Factory-fabricated, viscous-coated, flat-panel type.
2) Thickness: 1 inch.
3) Merv according to ASHRAE 52.2: 5.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Refer to Schedule
b. Refrigerant Charge: R-410A.
c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 210/240.

3. Refer to Schedule for condenser coil coating.

4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Refer to notes on schedule and Control equipment and sequence of operation are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence and Operations for HVAC Controls."

B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounted, compressor-condenser components on 4-inch thick, reinforced concrete base that is 4 inches larger, on each side, than unit. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install ground-mounted, compressor-condenser components on polyethylene mounting base.

E. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above at cost to the contractor.

E. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 260000 - BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions, Division 1 Specification Sections and all relevant documents shall form a part of this Division of the Specifications, and shall be incorporated in this Section and each Division 16 Section hereinafter as if repeated verbatim herein. All conditions imposed by these documents shall be applicable to all portions of the work under this Division. Certain specific paragraphs of said references may be referred to hereinafter in this Division. These references are intended to point out specific items to the Contractor, but in no way relieve him of the responsibility of reading and complying with all relevant parts of the entire Specification.

B. The Contractor shall examine and coordinate with all Contract Drawings and Specifications, and all Addenda issued. Failure to comply shall not relieve him of responsibility. The omission of details of other portions of the work from this Division shall not be used as a basis for a request for additional compensation.

C. The specific features and details for other portions of the work related to the construction in progress or to the existing building(s) shall be determined by examination at the site.

1.02 SCOPE OF WORK

A. The requirements contained in this Section apply to all work performed under Division 16 of these Specifications.

B. The work covered by this Division of the Specifications comprises the furnishing of labor, material, equipment, transportation, tools and services, and performing operations required for, and reasonably incidental to, the installation of the work in accordance with the applicable Contract Documents, and subject to the terms and conditions of the Contract.

C. Refer to other Divisions of the Specifications for related work.

1.03 DEFINITION OF "CONTRACTOR"

A. Where the word "Contractor" is used under any Section of this Division of the Specifications, it shall mean the Contractor engaged to execute the work included under that Section.

1.04 RESPONSIBILITY OF THE CONTRACTOR

A. The Contractor shall be responsible for all work of every description in connection with this Division of the Specifications. The Contractor shall specifically and distinctly assume, and does so assume, all risk for damage or injury from whatever cause to property or person used or employed on or in connection with this work and of all damages or injury to any person or property wherever located, resulting from an action or operation under the Contract in connection with the work, and undertake the responsibility to defend the Owner against all claims on account of any such damage or injury.

B. The Contractor will be held responsible for the satisfactory execution and completion of the work in

accordance with the true intent of the Contract Documents. The Contractor shall provide without extra charge all incidental items required as part of the work, even though it may not be specifically indicated. If the Contractor has reason for objecting to the use of any material, equipment, device or method of construction as indicated, he shall make report of such objections to the Owner's Representative, obtain proper approval and adjustment to the Contract, and shall proceed with the work.

1.05 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and similar phrases occur, it is the intent that the materials, equipment and devices described be furnished, installed and connected under this Division, complete for operation, unless specifically noted to the contrary.

B. It is also the intent, unless specifically noted to the contrary, that all materials, equipment and devices described and specified under this Division of the Specifications be similarly furnished, installed and connected under this Division, whether or not a phrase as described in the preceding paragraph has been actually included.

1.06 ORDINANCES, PERMITS AND CODES

A. It shall be the Contractor's duty to perform the work and provide the materials covered by these specifications in conformance with all ordinances and regulations of all authorities having jurisdiction.

B. All work herein shall conform to all applicable laws, ordinances and regulations of the local utility companies.

C. The Contractor shall obtain and pay for all permit and connection fees as required for the complete installation of the specified systems, equipment, devices and materials.

D. The Contractor shall obtain permits, plan checks, inspections and approvals applicable to the work as required by the regulatory authorities. Fees and costs of any nature whatsoever incidental to these permits, inspections and approvals shall be assumed and paid by the Contractor. The pro-rata costs, if any, for utilities serving this property will be paid for by the Owner and shall not be included as part of this Contract.

E. The work shall be in accordance with, but shall not be limited to, the requirements of:
1. National Fire Protection Association
2. National Electrical Code
3. National Safety Code
4. State of Texas Safety Code
5. Applicable City Building Codes
6. State of Texas Building Codes

F. Codes and standards referred to are minimum standards. Where the requirements of the Drawings or Specifications exceed those of the codes and regulations, the Drawings and Specifications govern.

1.07 MATERIALS, EQUIPMENT AND DEVICE DESCRIPTION

A. Materials, equipment and devices shall be of the best quality customarily applied in quality

commercial practice, and shall be the products of reputable manufacturers. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

B. Materials, equipment and devices furnished under this Division of the Specifications shall be essentially the standard product of the specified manufacturer, or where allowed, an alternate manufacturer. Where two or more units of the same kind or class of a specific item are required, these shall be the products of a single manufacturer; however, the component parts of the item need not be the products of one manufacturer.

C. In describing the various materials, equipment and devices, in general each item will be described singularly, even though there may be a multiplicity of identical items. Also, where the description is only general in nature, exact sizes, duties, space arrangements, horsepower requirements and other data shall be determined by reference to the Contract Documents.

D. Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. The Contractor shall verify that all materials, equipment and devices proposed for use on this project are within the constraints of the allocated space.

1.08 QUALITY ASSURANCE

A. Materials, equipment and devices shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall not be repaired at the job site, but shall be replaced with new materials, equipment or devices identical with those damaged, unless specifically approved otherwise by the Owner's Representative.

B. Wherever a UL standard has been established for a particular type of material, equipment or device, each item of such material, equipment or device provided on this project shall meet the requirements of the UL standard in every way, and shall be UL listed and labeled.

1.09 REFERENCE STANDARDS

A. Materials, equipment, devices and workmanship shall comply with applicable local, county, state and national codes, laws and ordinances, utility company regulations and industry standards.

B. In case of differences between building codes, state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Owner's Representative in writing of any such difference. Should the Contractor perform any work that does not comply with local codes, laws and ordinances, industry standards or other governing regulations, the work shall be corrected of noncompliance deficiencies with the Contractor bearing all costs.

C. In addition to the aforementioned ordinances, industry standards published by the following organizations shall apply:

AABM	-	American Association of Battery Manufacturers
AIA	-	American Institute of Architects
ANSI	-	American National Standards Institute
ASTM	-	American Society for Testing and Materials
CBM	-	Certified Ballast Manufacturers Association
ETL	-	Electrical Testing Laboratories
FM	-	Factory Mutual

ICEA	-	Insulated Cable Engineers Associated
IEEE	-	Institute of Electrical and Electronic Engineers
IES	-	Illuminating Engineering Society
IRI	-	Industrial Risk Insurance
NBS	-	National Bureau of Standards
NEC	-	National Electrical Code
NECA	-	National Electrical Contractors Association
NEMA	-	National Electrical Manufacturers Association
NESC	-	National Electrical Safety Code
NETA	-	National Electrical Testing Association
NFPA	-	National Fire Protection Association
UL		Underwriters Laboratories

D. Where the Contract Documents exceed the above requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below the minimum legal standards.

1.10 DRAWINGS AND SPECIFICATIONS

A. The interrelation of the Drawings (including the schedules) and the Specifications are as follows:

1. The Drawings establish quantities, locations, dimensions and details of materials, equipment and devices. The schedules on the Drawings indicate the capacities, characteristics and components.

2. The Specifications provide written requirements for the quality, standard and nature of the materials, equipment, devices and construction systems.

B. The Drawings and Specifications shall be considered as being compatible; therefore, the work called for by one and not by the other shall be furnished and installed as though called for by both. Resolution of conflicts between Drawings and Specifications shall be as follows:

1. If the Drawings and Specifications disagree in themselves, or with each other, the Contractor's pricing shall be based on furnishing and installing the most expensive combination of quality and quantity of work indicated. In the event of this type of disagreement, the resolution shall be determined by the Architect/Engineer.
2. The Contractor shall be responsible for bringing any conflicts in the Drawings and the Specifications to the attention of the Architect/Engineer prior to any work being performed.
3. In general, if there is conflict between the Drawings and Specifications, the Drawings shall govern the Specifications.
4. Where the Specifications do not fully agree with schedules on the Drawings, the schedules shall govern. Actual numerical dimensions indicated on the Drawings govern scale measurements and large scale details govern small scale drawings.
5. Materials, equipment and devices called for on the Drawings and not indicated herein, shall be completely provided and installed as though it were fully described herein.
6. Materials, equipment and devices called for herein shall be completely provided and installed, whether or not it is fully detailed, scheduled or indicated on the Drawings.

C. The Contractor shall examine the Drawings and Specifications of the other portions of the work for fixtures and finishes in connection with this work. The Contractor shall carefully examine the Drawings to determine the general construction conditions, and shall familiarize himself with all limitations caused by such conditions.

C. When discrepancies exist between scale and dimension, or between the Drawings of the various portions of the work, they shall be called to the attention of the Architect/Engineer for further instruction, whose instructions shall be final and binding and work promptly resumed without any additional cost to the Owner.

D. Review the construction details of the building(s) as illustrated on the Drawings of the various portions of the work and be guided thereby. Route conduits and set all boxes as required by the pace of the general construction.

E. The Drawings diagrammatically show the sizes and locations of the various equipment and devices, and the sizes of the major interconnecting wires, without showing exact details as to elevations, offsets, control wiring and other installation requirements. Carefully layout the work at the site to conform to the architectural and structural conditions, to avoid obstructions and to permit proper grading of pipe associated with other portions of the work. Determine the exact location of equipment and devices and connections thereto by reference to the submittals and rough-in drawings, and by measurements at the site. Make minor relocations necessitated by the conditions at the site, or directed by the Architect/Engineer, without additional cost to the Owner.

F. The Drawings and Specifications are intended to describe and illustrate systems which will not interfere with the structure of the building(s), fit into the available spaces, and insure complete and satisfactory operating installations. Prepare installation drawings for all critical areas illustrating the installation of the work in this Division as related to the work of all other Divisions and correct all interferences with the other portions of the work or with the building structures before the work proceeds.

H. The Drawings do not indicate the existing electrical installations other than to identify modifications or extensions thereto. Visit the site and ascertain the conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work. Failure to comply with this shall not constitute grounds for any additional payment in connection with removing or modifying any part of the existing installation or installing any new or temporary work under this Division.

1.11 SHOP DRAWINGS AND SUBMITTAL DATA

A. Process shop drawings and submittal data to insure that the proposed materials, equipment and devices conform to the requirements of the Contract Documents, and that there are no omissions or duplications. Provide layouts, fabrication information and data for systems, materials, equipment and devices proposed for the project.

B. Shop drawings shall be drawn on a scale not less than 1/4 inch equals 1 foot showing actual dimensions. Shop drawings shall include, but not be limited to:
   1. Switchboards
   2. Distribution Panelboards
   3. Lighting/Appliance Panelboards

C. Submittal data (manufacturer's catalog data) shall include, but not be limited to:
   1. Equipment: switchboard, panelboards, transformers, disconnect switches, circuit breakers, fuses, etc.
   2. Materials: conduit, conductors, connectors, supports, etc.
   3. Lighting fixtures and lamps.
   4. Wiring devices.

D. The submittal data shall not consist of manufacturer's catalogs or cut sheets that contain no indication of the exact item offered. The submission on individual items shall designate the exact item offered.

E. Do not submit detailed quantitative listings of materials, equipment and devices. It is the Contractor's responsibility to provide proper sizes and quantities to conform with Contract Documents.

F. Assemble submittals on related items procured from a single manufacturer in brochures or other suitable package form, rather than submitting a multiplicity of loose sheets.

G. The Contractor shall submit shop drawings whenever equipment proposed varies in physical size and arrangement from that indicated thus causing rearrangement of equipment space, where tight spaces require extreme coordination between this work and other work, where called for elsewhere in these Specifications and where specifically requested by the Architect/ Engineer. Shop drawings shall be prepared at a scale of not less than 1/4 inch equals 1 foot.

1.12 SUBSTITUTIONS

A. Where a single manufacturer is mentioned by trade name or manufacturer's name, unless specifically noted otherwise, it is the only manufacturer that will be accepted.
B. Where multiple manufacturers are listed, none other than those manufacturers will be accepted.
C. It shall be understood that space allocations have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. If any item of equipment or device is offered in substitution which differs substantially in dimension or configuration from that indicated on the Drawings or specifications, provide as part of the submittal 1/4 inch equals 1 foot scaled drawings showing that the substitute can be installed in the space available without interfering with other portions of the work or with access for operations and maintenance in the completed project.
D. Where substitute equipment or devices requiring different arrangement or connections from that indicated is accepted by the Architect/Engineer, install the equipment or devices to operate properly and in harmony with the intent of the Contract Documents, making all incidental changes in piping, ductwork or wiring resulting from the equipment or device selection without any additional cost to the Owner. The Contractor shall pay all additional costs incurred by other portions of the work in connection with the substituted equipment or device.
E. The Architect/Engineer reserves the right to call for samples of any item of material, equipment or device offered in substitution, together with a sample of the specific item when, in their opinion, the quality of the item and/or the appearance is involved, and it is deemed that an evaluation of the item may be better made by visual inspection.
F. When any request for a substitution of material, equipment or device is submitted and rejected, the item named in the Contract Documents shall be furnished. Repetitive submittal of substitutions for the same item will not be considered.

1.13 INSTALLATION DRAWINGS

A. Prepare installation drawings for coordinating the work of this Division with the work of other Divisions, to illustrate its concealment in finished spaces, to avoid obstructions, and to demonstrate the adaptability of any item of material, equipment or device in the space upon which the Contract Documents are based.

B. Use these drawings in the field for the actual installation of this work. Provide three (3) copies, not

for approval, to the Architect/Engineer for his information, review and record.

1.14 WORKMANSHIP AND INSTALLATION

A. In no case shall the Contractor provide a class of material, equipment, device or workmanship less than that required by the Contract Documents or applicable codes, regulations, ordinances or standards. All modifications which may be required by a local authority having legal jurisdiction over all or any part of the work shall be made by the Contractor without any additional charge. In all cases where such authority requires deviations from the requirements of the Drawings or Specifications, the Contractor shall report same to the Owner's Representative and shall secure his approval before the work is started.

B. The work shall be performed by properly licensed technicians skilled in their respective trades. All materials, equipment and devices shall be installed in accordance with the recommendations of the manufacturer and in the best standard practice to bring about results of a first class condition.

C. The NECA "Standards of Installation" as published by the National Electrical Contractors Association shall be considered a part of these Specifications, except as specifically modified by other provisions contained in these Specifications.

1.15 WARRANTY

A. All materials, equipment, devices and workmanship shall be warranted for a period of one year from the date of acceptance by the Architect/Engineer for beneficial use by the Owner, except that where specific equipment is noted to have extended warranties. The warranty shall be in accordance with AIA Document A201. The Contractor shall be responsible for the proper registration of these warranties so that the Owner can make all proper claims should future need develop.

B.

B. The Contractor shall furnish to the Architect/Engineer for transmittal to the Owner, the name, address and telephone number of those persons responsible for service on systems and equipment covered by the warranty.

1.16 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, the Contractor may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments and complete punch list items before final acceptance by the Owner.

1.17 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of competent engineers and/or technicians acceptable to the Architect/ Engineer to instruct other representatives of the Owner in the complete and detailed operation of each item of equipment or device of all the various electrical systems. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.

B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the

instructions have been given to the Owner's personnel and the letter of release acknowledged.

C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include wiring diagrams, manufacturer's operating and maintenance instructions, parts lists (with sources identified), and other data as appropriate for each system.

1.18 SCHEDULE AND SEQUENCE OF WORK

A. The Contractor shall meet and cooperate with the Owner and Architect/Engineer to schedule and sequence this work so as to insure meeting scheduled completion dates and avoid delaying other portions of the work. Work requiring special sequencing shall be at no additional cost to the Owner and shall have no impact on the schedule.

1.19 INSPECTIONS AND CERTIFICATIONS

A. Obtain timely inspections of the installation by the regulatory authorities. Remedy any deficiencies to the satisfaction of the inspecting official.

B. Upon final completion of the work, obtain certificates of acceptance from the regulatory authorities. Deliver the certificates to the Architect/Engineer for transmission to the Owner.

1.20 EQUIPMENT INSTALLATION

A. Install equipment and devices in a manner to permit access to all surfaces or components, requiring such access, without the need to disassemble other unrelated parts of the work.

B. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled at the job site and reassembled at its final location. Apparatus not so specified may be disassembled and reassembled in the proper location.

C. Furnish all scaffolding, rigging and hoisting required for the installation of all the work.

D. Large equipment assemblies and components which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the site and placed in the appropriate spaces before the enclosing structure is complete.

1.21 EQUIPMENT FOUNDATIONS

A. Where indicated on the Drawings, provide foundations for electrical equipment. This shall consist of concrete housekeeping pads constructed in accordance with the details on the Drawings, these Specifications, manufacturer's recommendations and Division 3.

B. All pads shall be 4" high and extend a maximum 2" beyond the actual equipment size. Coordinate the proper size of the pad with the equipment furnished. Furnish all anchor bolts and other accessories required for casting the concrete pad. After the equipment is set on the pad, the equipment shall be fully grouted to the pad and all void spaces shall be filled with a non-shrinking grout.

1.22 SLEEVES

A. Each conduit, regardless of material, which passes through a concrete slab, masonry wall, or roof or portion of the building structure shall be free from the structure and shall pass through a sleeve.

B. All sleeves shall be constructed from electrical-metallic tubing or equivalent weight galvanized steel tubing and shall be flush on both sides of the surface penetrated, unless noted otherwise. All sleeves penetrating the roof areas shall extend a minimum 10 inches above the roof with approved weatherproof counterflashing attached to the conduit above the roof. All sleeves penetrating floors shall extend a minimum of 6 inches above the finished floors. The sleeves shall be sized to allow free passage of the conduit to be inserted.

C. Sleeves passing through walls or floors on or below grade or in moist areas shall be constructed of galvanized rigid steel and shall be designed with a suitable flange in the center to form a waterproof passage. After the conduit has been installed in the sleeves, the void space around the conduit shall be caulked with jute twine and filled with an asphalt-base compound to insure a waterproof penetration.

1.23 ESCUTCHEONS

A. In each finished space, provided a chromium plated, sectional escutcheon on each conduit, or hanger rod penetrating a wall, floor or ceiling.

B. Size escutcheons and collars to fit snugly around conduit and rods.

C. Where required, provide escutcheons with set screws so that they fit snugly against the finished surface.

1.24 ACCESS PANELS

A. Provide wall and ceiling access panels for unrestricted access to all concealed electrical equipment items and devices installed behind furrings, chases or non-removable suspended ceilings.

B. Access panels shall be UL listed and labeled as required to suit the fire rating of the surface in which installed, with mounting straps, concealed hinges, screwdriver locks, 180 degree open door design, 16 gauge steel construction and door and frame finished in prime coat finish. Panels shall be 12-inch by 12-inch minimum size, but shall be larger as the access requirement of the concealed electrical equipment item or device increases.

1.25 EXCAVATION, TRENCHING AND BACKFILLING

A. All excavating, trenching and backfilling shall generally be performed in accordance with the procedures and using the materials as described in Division 2. Provide all excavation required in connection with the installation of the work under this Division. After the work has been installed, tested and approved, backfill all excavations with suitable material.

B. Bottoms of trenches shall be cut to grade. Should rock be encountered, same shall be excavated to a depth of six (6) inches below bottom of conduit and space shall be filled and tamped as specified hereinafter. Should it be required to lay conduit on fill, fill shall first be compacted.

C. All conduit shall be installed promptly after excavation has been done so as to keep excavations open as short a time as possible.

D. Trenches shall be excavated to the required depths. Depth of cover shall be as required by the NEC or as indicated on Drawings. Keep banks of trenches as nearly vertical as possible, and provide adequate shoring where required.

E. When excavation is below the shale or subgrade level, backfill with granular fill or approved backfill material from the site to a depth of 12 inches above top of conduit, but in no case less than 1'-0" below the subgrade surface. The remainder of backfill to the shale or subgrade surface shall be an impervious material and shall be compacted at not less than 95 percent of the maximum dry density as defined by ASTM D-698. At all times, the top of the subgrade shall be kept in such condition that it will drain readily and effectively. A mud slab shall be placed over excavation where required by the Drawings or Specifications. Backfill above the subsurface shall be granular fill or approved select backfill from site.

F. Beyond building walls or above the shale or subgrade level, backfill with sand or granular fill to a depth of 12 inches above top of conduit and remainder of trench filled with approved select backfill material from the site.

G. Bottoms of trenches shall be tamped hard and graded to secure the maximum fall. Where rock is excavated below the bottom of the conduit, and before laying the conduit, fill the space between the bottom of the conduit and the rock surface with sand, thoroughly tamped.

H. Trenches dug in fill shall have the conduit supported down to load-bearing soil. After conduits have been inspected and approved by the Owner's Representative, trenches shall be filled with approved backfill material which shall be firmly compacted, flooded if necessary and thoroughly tamped. Do not backfill with any fill containing rocks, frozen earth or debris.

I. Include the cutting of all sidewalks, streets and other pavements and repairing the openings in them to return the surface to approximately its original condition.

1.26 CUTTING AND PATCHING

A. Cut all openings required to install the work or to repair any defective work. This cutting shall be performed under the Architect's/Engineer's direction and due diligence exercised to avoid cutting openings larger than required or in the wrong locations.

B. No cutting or drilling of any sort will be permitted in the webs of prestressed, precast concrete structural elements. Use core drills or power driven saws to cut openings in the flanges of other such elements; the use of reciprocating drills will not be permitted. The cutting of structural members without first having received written permission from the Architect/ Engineer is prohibited.

C. Where openings are cut in fire-rated walls or floors, seal the annular space between the work installed and the fire-rated construction. Sealant, as applied, shall be fire rated to maintain the fire rating of the construction penetrated. Sealant shall be re-enterable (before fire) to alter penetrations. Apply in strict accordance with manufacturer's instructions.

1.27 SEALING OF PENETRATIONS

A. All penetrations in horizontal or vertical fire-rated construction shall be sealed using approved fire-rated sealing materials equivalent to the following:

1. Foam: Dow Corning 3-6548 RTV silicone foam, liquid component Part 4 (black) and liquid component Part B (off-white).
2. Sealant: Dow Corning 96-081 RTV silicone adhesive sealant.
3. Damming Materials: Mineral fiberboard, mineral fiber matting, mineral fiber putty, plywood or particle board, as selected by applicator.

B. Preparation: Remove combustible materials and loose impediments from penetration opening and involved surfaces. Remove free liquid and oil from penetration surfaces.

C. Installation: In accordance with manufacturer's instructions, install damming materials and sealant to cover and seal penetration openings; inject foam mixtures into openings.

1.28 PROTECTION OF APPARATUS

A. At all times take every precaution to properly protect apparatus from damage due to dust, dirt, water, etc. or from damage due to physical forces. Include the erection of temporary shelters as required, to adequately protect any apparatus stored at the site, the cribbing of any apparatus directly above the construction, and the covering of apparatus in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Architect/Engineer will be sufficient cause for the rejection of the pieces of apparatus in question.

B. Responsibility for the protection of apparatus extend also to existing apparatus involved in this Division of the work, whether such apparatus is designated to be used temporarily and later removed, or is to be reused as a part of the permanent installation. Erect temporary sheltering structures, provide temporary bracing and supports, or cover equipment as required or directed to afford proper protection for that equipment.

C. The Contractor shall protect this work and the work of all other Contractors from damage by his work or workmen and shall make good any damage thus caused. He shall also be responsible for the proper protection of his equipment, machinery, materials and accessories delivered and installed on the job.

1.29 INSTALLATION AND CONNECTION OF OTHER DIVISION'S EQUIPMENT

A. Verify the electrical requirements of all equipment furnished under other Divisions, separate contracts, or by the Owner. Install conduit, power wiring, control wiring, devices, etc. as required for complete operation of all equipment.

1.30 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES

A. The location of power, data and telephone outlets, wall switches and other related devices may be relocated at the Owner's option, at no additional cost to the Owner, to a point within 10 feet of their present location provided the Contractor is notified prior to installation.

1.31 COOPERATION AND CLEAN-UP

A. It shall be the responsibility of the Contractor to cooperate fully to keep the job site in a clean and safe condition. Upon the completion of the job, the Contractor shall immediately remove all of his tools, equipment, surplus materials and debris.

B. After the installation is complete, and before the equipment is energized, clean the interior and

exterior of all equipment thoroughly. Clean equipment, removing all debris, rubbish and foreign materials. Each component shall be cleaned and all dust and other foreign material removed. Components shall be cleaned of oxidation. The inside and outside of all switchgear shall also be wiped clean with a lemon-oil rag after all other cleaning is complete.

C. Any portion of the work requiring touch-up finishing shall be so finished to equal the specified finish on the product.

1.32 RECORD DRAWINGS AND DOCUMENTATION FOR OWNER

A. The Contractor shall obtain at his own expense a complete set of blueline prints on which to keep an accurate record of the installation of all materials, equipment and devices covered by the Contract. The record drawings shall indicate the location of all equipment and devices, and the routing of all systems. All piping and conduit buried in concrete slabs, walls and below grade shall be located by dimension; both horizontally and by vertical elevation, unless a surface mounted device in each space indicates the exact location. Obtain one complete reproducible set of the original drawings on which to neatly, legibly and accurately transfer all project related notations and deliver these drawings to the Architect/Engineer at job completion before final payment and delivery to the Owner. The above data, with the exception of the record drawings, shall be delivered prior to final acceptance.

B. The Contractor shall accumulate in duplicate during the job progress, the following data prepared in indexed 3-ring looseleaf, hard-back binders sized for 8-1/2 inch by 11 inch sheets. No binder shall exceed 3-1/2 inches thick. This data shall be turned over to the Architect/Engineer for review and subsequent delivery to the Owner prior to final acceptance.
   1. Warranties, guarantees and manufacturer's directions on material, equipment and devices covered by the Contract.
   2. Approved lighting fixture brochures, wiring diagrams and control diagrams.
   3. Copies of approved submittals and shop drawings.
   4. Operating instructions for major apparatus and recommended maintenance procedures.
   5. Copies of all other data and/or drawings required during construction.
   6. Repair parts list of major apparatus, including name, address and telephone number of local supplier or representative.
   7. Tag charts and diagrams hereinbefore specified.

1.33 FINAL OBSERVATION

A. The purpose of the final observation is to determine whether the Contractor has completed the construction in accordance with the Contract Documents and that in the Owner Representative's opinion the installation is satisfactory for final acceptance by the Owner.

B. It shall be the responsibility of the Contractor to assure that the installation is ready for final acceptance prior to calling upon the Architect/Engineer to make a final observation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 260000

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SECTION 260003 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Connecting Bolts and Nuts: [**Carbon steel with corrosion-resistant coating**] [**Stainless steel**] of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 16051

SECTION 260100 – ELECTRICAL SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Division Section as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of Division 26/28 submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer's and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals

required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Engineer’s final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for delivery.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer’s Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing and Project record drawings.

    a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Contractor shall execute a data licensing agreement in the form of Halff Associates’ Standard form.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. **Submit all submittal items required for each Specification Section within a Construction Division concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule. ***
    - **This submittal package shall be comprehensive document by Division and not piecemealed by specification section.**
3. Submit action submittals and informational submittals required by the same Specification Section concurrent.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination. For example, HVAC Equipment must be submitted and approved prior to approval of Electrical gear.

    a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals is indicated, allow 15 working days for initial review of each submittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Engineer.
    d. Name of Construction Manager, where applicable.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Division Section or number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

    j. Number and title of appropriate Specification.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, initial submittal may serve as final submittal.

    a. When paper copies are required, submit one copy of submittal.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return without review submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Engineer.
6) Name of Construction Manager, where applicable.
7) Name of Contractor.
8) Name of firm or entity that prepared submittal.
9) Names of subcontractor, manufacturer, and supplier.
10) Category and type of submittal.
11) Submittal purpose and description.
12) Specification Section number and title.
13) Specification paragraph number or drawing designation and generic name for each of multiple items.
14) Drawing number and detail references, as appropriate.
15) Indication of full or partial submittal.
16) Transmittal number, numbered consecutively.
17) Submittal and transmittal distribution record.
18) Remarks.
19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item. Alternately, submit package as a comprehensive .pdf document by Division with each Specification Section tabbed.
2. Name file with submittal number or other unique identifier, including revision identifier.

a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:

a. Project name.
b. Date.
c. Name and address of Engineer.
d. Name of Construction Manager, where applicable.
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.

k. Specification paragraph number or drawing designation and generic name for each of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.
r. Other necessary identification.
s. Remarks.

F. Options: Identify options requiring selection by Engineer.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer’s action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer’s action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web site or FTP site specifically established for Project.

a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

1. Action Submittals: For submittal formats 11 x 17 and larger, submit two paper copies of each submittal unless otherwise indicated in addition to the electronically posted submittal. Engineer will return one copy of paper submittal.
2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each construction Division and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data (8-1/2 x 11 format only) in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.

c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer, if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 11 x 17 but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
   a. Two opaque (bond) copies of each submittal. Engineer will return one copy. Engineer will return one copy. Submit also one electronic file for record keeping.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. "Samples for Verification" Subparagraph below can be used with or without Samples for initial selection. Revise to suit Project.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.

1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date

of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Submittals not required by the Contract Documents may be returned by the Engineer without action.

END OF SECTION 260100

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Sections include the following:

1. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.
6. Encore.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THW THHN-THWN and SO.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

I. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.

J. Class 1 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Torque test conductor connections and terminations to manufacturer's recommended values.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system (where specified).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Grounding arrangements and connections for separately derived systems.
4. Grounding for sensitive electronic equipment.

C. Qualification Data: For qualified testing agency and testing agency's field supervisor.

D. Field quality-control reports.

E. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems.

    a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
    b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, [1/4 by 4 inches (6.3 by 100 mm)] in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive

insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from

panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

H. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System (where specified): Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install [tinned]bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

3.5 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer[and at the grounding electrode conductor where exposed].

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment 3 ohm(s).
5. Manhole Grounds: 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.

3. Equipment supports.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Hilti Inc.
3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners or threaded through wall.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. FMC: Flexible metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. NBR: Acrylonitrile-butadiene rubber.

F. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:

a. Conduit entry provisions, including locations and conduit sizes.
b. Frame and cover design.
c. Grounding details.

d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

C. Rigid Steel Conduit: ANSI C80.1.

D. EMT: ANSI C80.3.

E. FMC: Zinc-coated steel

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Steel -screw or compression type.

H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. CANTEX Inc.
4. CertainTeed Corp.; Pipe & Plastics Group.
5. Lamson & Sessions; Carlon Electrical Products.
6. RACO; a Hubbell Company.
7. Thomas & Betts Corporation.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.
4. Wiremolp.
5. Cabolafil.

C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 or 3R, unless otherwise indicated.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Wireway Covers: As indicated.

F. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular. (As indicated on drawings)

F. Nonmetallic Floor Boxes: Nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic or fiberglass.

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.5 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.6 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Galvanized Rigid steel conduit.
2. Concealed Conduit, Aboveground: EMT
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Mechanical Shop
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Fuel storage tanks.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT or cable tray. All conduits shall have plastic bushing at the ends.
8. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT
9. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable EMT.
10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations. HUBS to match conduit.

C. Minimum Raceway Size: 1/2-inch.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation. Use conduit caps to protect installed conduit against entrance of dirt and moisture before area is dryed in and cable or wire are not immediately installed. Tape covering of conduit ends is not acceptable.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from Type EPC-40-PVC to rigid steel conduit, before rising above the floor.
4. Elbows larger than 1/2" or on runs longer than 50' shall be rigid steel.
5. Tape all GRC with 2" overlapping tape where underground or where in contact with concrete.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
   c. Indoor Spaces: Connected with the Outdoors without Physical Separation: [125 deg F (70 deg C) temperature change.
   d. Attics: 135 deg F (75 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
4. Unless expansion fitting has internal bonding braid, a green insulated grounding conductor shall be pulled in conduit.

O. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Q. Set metal floor boxes level and flush with finished floor surface.

R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below the frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 INSTALLATION IN EXPLOSION HAZARDOUS LOCATIONS

A. Electrical Source: Conduit explosion proof fitting with Chico Cooper hinds compound installed at 18-inches from electrical source. Conduit shall be galvanized Rigid Steel until transition to horizontal underground.

B. Underground Conduit: PVC – Schedule 40.

C. Load – Hazardous Zone: Stub up transition shall be of galvanized rigid steel conduit. A conduit explosion proof fitting with Chico Cooper Crouse hinds compound installed 18 – inches above ground shall be provided for electrical load

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.9 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.
4. Manholes.

1.3 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes, and other utility structures.
4. Include warning tape.
5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including locations and duct sizes.
c. Include reinforcement details.
d. Include frame and cover design and manhole frame support rings.
e. Include Ladder details.
f. Include grounding details.
g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.

h. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes.
c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.8 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager no fewer than 10 days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

C. Ground Water: Assume ground-water level is 36 inches (900 mm) below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

B. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 75 mm) in size, manufactured from 6000-psi (41-MPa) concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.4 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, “TELECOM."
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes [12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers made of polymer concrete.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.5 PRECAST MANHOLES

A.

1. Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
2. Window opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
3. Window openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.

B. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

1. Type and size shall match fittings to duct or conduit to be terminated.
2. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.

C. Concrete Knockout Panels: 1-1/2 to 2 inches (38 to 50 mm) thick, for future conduit entrance and sleeve for ground rod.

D. Ground Rod Sleeve: Provide a 3-inch (75-mm) PVC conduit sleeve in manhole floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the ducts routed from the facility.

E. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables More than 600 V: RNC, NEMA Type EPC-80-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

D. Underground Ducts Crossing Paved Paths, Walks, and Driveways, Roadway and Railroad: RNC, NEMA Type EPC-80-PVC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
5. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated

to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

F. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch (19 mm).
3. Grout end bells into structure walls from both sides to provide watertight entrances.

G. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

H. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

I. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in empty ducts.

J. Concrete-Encased Ducts: Support ducts on duct separators.

1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 12 inches (300 mm) wider than duct bank on each side.
3. Width: Excavate trench 3 inches (75 mm) wider than duct bank on each side.
4. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
5. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
6. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Minimum Space between Ducts: 3 inches (75 mm) between ducts and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and signal ducts.
8. Elbows: Use manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Extend concrete encasement throughout length of elbow.

9. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.

10. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
11. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
12. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover at top and bottom, and a minimum of 2 inches (50 mm) on each side of duct bank.
13. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (15-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.

14. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

K. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.
4. Depth: Install top of duct bank at least 36 inches (900 mm) below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.

7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

    a. Place minimum 3 inches (75 mm) of sand as a bed for duct bank. Place sand to a minimum of 6 inches (150 mm) above top level of duct bank.
    b. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct bank.

L. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried ducts and duct banks, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional planks 12 inches (300 mm) apart, horizontally.

M. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Cast-in-Place Manhole Installation:

1. Finish interior surfaces with a smooth-troweled finish.
2. Windows for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inches (38 to 50 mm) thick, arranged as indicated.
3. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.

B. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches (375 mm) below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch (25 mm) above finished grade.
3. Install handholes with bottom below frost line.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

D. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

E. Manhole Access: Circular opening in manhole roof; sized to match cover size.

1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
2. Install chimney, constructed of precast concrete collars and rings, to support cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for frame to chimney.

F. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days.

G. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

H. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

I. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

E. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

F. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep.

3.8 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- (150-mm-) long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Division 07 Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.3 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. 3.5 mils and 6” wide.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Polyethylene tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Inscriptions for Red-Colored Tapes: BURIED ELECTRIC LINE, CAUTION.
2. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

C. Warning label and sign shall include, but are not limited to, the following legends:
   1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
   2. Location of multiple main disconnects are at defined locations. Approved by Authority Having Jurisdiction.

2.4 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

   1. Engraved legend with black letters on white face .
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.6 CABLE TIES

A. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
   4. Color: Black.

B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
   5. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Secure plastic name plates to equipment fronts using screws or rivets. Use of adhesive shall be per owner's approval only.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and 600 V or Less, for Service, Feeder, and Branch Circuits More Than A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot (3-m)] [30-foot (10-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
1. Normal Power – White letters on Black background.
2. UPS – White letters on Orange background.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

    a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    b. Colors for 208/120-V Circuits:

        1) Phase A: Black.
        2) Phase B: Red.
        3) Phase C: Blue.
        4) Neutral: White.

    c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    a. Controls with external control power connections.

I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchgear.
   e. Switchboards.
   f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   g. Emergency system boxes and enclosures.
   h. Motor-control centers.
   i. Enclosed switches.
   j. Enclosed circuit breakers.
   k. Enclosed controllers.
   l. Variable-speed controllers.
   m. Push-button stations.
   n. Power transfer equipment.
   o. Contactors.
   p. Remote-controlled switches, dimmer modules, and control devices.
   q. Battery-inverter units.
   r. Battery racks.
   s. Power-generating units.
   t. Monitoring and control equipment.
   u. UPS equipment.

3. Nameplate Detail:

   a. For circuit breakers, panelboards, switchboards, disconnect switches, motor starters, and contactors: ¼-inch letters, identify source to and device load serves, including location.

4. Enclosure Color Coding:

   a. The following systems shall have each junction and pull box cover completely painted per the following:

System	Color of Box Cover
Ethernet Backbone	Blue
Telecommunications	Brown
FCMS	Green
Emergency Power	Red
Security**	White
Fire Alarm	Yellow
Clock	Fluorescent Violet
U.P.S.	Fluorescent Pink

**Security shall include, but not be limited to, the following systems:
- Card Access\Proximaty
- Duress Alarms
- Perimeter Door Alarms
- CCTV

END OF SECTION 260553

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SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes computer-based, fault-current and overcurrent protective device coordination studies. Protective devices shall be set based on results of the protective device coordination study.

1.3 SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

C. Qualification Data: For coordination-study specialist.

D. The following submittals shall be made concurrent with the approval for system protective devices. Submittals shall be in digital form and hard copy.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and Equipment Evaluation Reports.
3. Coordination-Study Report.
4. Completed power company transformer form.

1.4 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.
e. Voltage drop and voltage dip.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices shall be concurrent with submitted and approved coordination study.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other Division 26 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance. Utility transformer size and impedance are typically obtained from the actual serving utility engineer.
3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:

    a. Circuit-breaker and fuse-current ratings and types.
    b. Relays and associated power and current transformer ratings and ratios.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and/or X/R ratios.
    d. Generator kilovolt amperes, size, voltage, and source impedance.
    e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Busway ampacity and impedance.
    g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Voltage dip for largest motor based on utility transformer and system layout. Advise engineer if dip is greater than 5%.
    e. Generator thermal-damage curve.
    f. Ratings, types, and settings of utility company's overcurrent protective devices.
    g. Special overcurrent protective device settings or types stipulated by utility company.
    h. Time-current-characteristic curves of devices indicated to be coordinated.
    i. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a

current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. Switchgear and switchboard bus.
2. Distribution panelboard.
3. Branch circuit panelboard.
4. ATS.
5. Generator.

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 242.

1. Transformers:

   a. ANSI C57.12.10.
   b. ANSI C57.12.22.
   c. ANSI C57.12.40.
   d. IEEE C57.12.00.
   e. IEEE C57.96.
2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
3. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.
2. Show interrupting (5-cycle) and time-delayed currents assess the sensitivity of overcurrent relays and devices.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY AND VOLTAGE DIP STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 241 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

   a. Inrush current when first energized.
   b. Self-cooled, full-load current or forced-air-cooled, specified for that transformer.
   c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Motors served by system shall be reviewed for voltage dip. Report shall verify dip on start is less than 5%.

E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

   a. Device tag.
   b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
   c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
   d. Fuse-current rating and type.
   e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

   a. Device tag.
   b. Voltage and current ratio for curves.
   c. Three-phase and single-phase damage points for each transformer.

d. No damage, melting, and clearing curves for fuses.
e. Cable damage curves.
f. Transformer inrush points.
g. Maximum fault-current cutoff point.

3. Motor voltage dip report shall list motors and report on voltage dip expected at motor. Particular attention shall be paid to chiller and fire pump motors.

G. Completed data sheets for setting of overcurrent protective devices.

END OF SECTION 260573

SECTION 260573.13 - SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Short-circuit study input data, including completed computer program input data sheets.
2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary

submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Short-Circuit Study Software Developer.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. SKM or equal.

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. Calculated asymmetrical fault currents:

1) Based on fault-point X/R ratio.
2) Based on calculated symmetrical value multiplied by 1.6.
3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.

1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Architect.
2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.

4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.
2. Incoming switchgear.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.

5. Control panels.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.
8. Disconnect switches.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION 260573.13

SECTION 260574 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form.

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary

submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Software Developer.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:

1. SKM Power Tools or Equal

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

G. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch (76-by-127-mm) thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.4 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:

1. Low-voltage switchboard.
2. Switchgear.

3. Control panel.
4. ATS
5. Generator
6. Panelboard

3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 260574

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SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Standalone daylight-harvesting switching controls.
4. Indoor occupancy sensors.
5. Outdoor motion sensors.
6. Lighting contactors.

B. Related Requirements:

1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

2. Division 26 Section: Network

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Intermatic, Inc.
   2. NSi Industries LLC; TORK Products.
   3. Paragon.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Contact Configuration: SPST.
   3. Contact Rating: 20-A ballast load, 120-/240-V ac.
   4. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
   5. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
   6. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
   7. Astronomic Time: All channels.
   8. Automatic daylight savings time changeover.
   9. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
   1. Intermatic, Inc.
   2. NSi Industries LLC; TORK Products.
   3. Paragon Electric Co.

B. Description: Solid state, with dry contacts rated for 1800-VA tungsten or 1000-VA inductive or, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
   1. Light-Level Monitoring Range: 1.5 to 10 fc , with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
   2. Time Delay: Fifteen second minimum, to prevent false operation.
   3. Surge Protection: Metal-oxide varistor.
   4. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 DAYLIGHT-HARVESTING SWITCHING CONTROLS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company Inc.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. NSi Industries LLC; TORK Products.
6. Sensor Switch, Inc.
7. Watt Stopper.
8.

B. Ceiling-Mounted Switching Controls: Solid-state, light-level sensor unit, with separate power pack, to detect changes in indoor lighting levels that are perceived by the eye.

2.4 DAYLIGHT-HARVESTING DIMMING CONTROLS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
2. Leviton Mfg. Company Inc.
3. Watt Stopper.
4. Lutron.

B. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.

1. Lighting control set point is based on two lighting conditions:

    a. When no daylight is present (target level).
    b. When significant daylight is present.

2. System programming is done with two hand-held, remote-control tools.

    a. Initial setup tool.
    b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with separate controller unit, to detect changes in lighting levels that are perceived by the eye.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Sensor Output: 0- to 10-V dc to operate electronic dimming ballasts. Sensor is powered by controller unit.
3. Power Pack: Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.
4. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.

2.5 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hubbell Building Automation, Inc.
   2. Leviton Mfg. Company Inc.
   3. Lutron Electronics Co., Inc.
   4. Sensor Switch, Inc.
   5. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack. Include power packs as required.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:

      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.
   8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

   1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
   2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.
   3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot high ceiling.

D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .

   1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s .

2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot high ceiling in a corridor not wider than 14 feet.

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.

2.6 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Hubbell Building Automation, Inc.
2. Leviton Mfg. Company Inc.
3. Lightolier Controls.
4. Lutron Electronics Co., Inc.
5. Sensor Switch, Inc.
6. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor As indicated on plans:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
2. Sensing Technology: Dual technology.
3. Switch Type: dual circuit. Field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Match the circuit voltage Dual voltage, 120 and 277 V dual-technology type.

5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
2. Sensing Technology: Dual Technology
3. Switch Type: Dual circuit. Field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Match the circuit voltage Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.7 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Corporation.
4. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.
5. Square D; a brand of Schneider Electric.
6. Siemens

B. Description: Electrically operated and mechanically or electrically held, combination-type lighting contactors with, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

C. BAS Interface: Where shown on drawings. Provide hardware interface to enable the BAS to monitor and control lighting contactors.

1. Monitoring: On-off status.

2. Control: On-off operation.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Control Cable: or Contractor at his option may use multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Verify voltage drop if use of smaller than No. 12 AWG.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies. Do not mount sensor in area that will have interfadence with HVAC systems.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

E. Adjustments of occupancy sensors whall be made by the contractor with the factory authorized representative present. Settings shall be as directed by owner. Include a minimum of 4 hours training.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Division 26 Section "Network Lighting Controls."

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

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SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Electronic-grade panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on log-log graph paper; include selectable ranges for each type of overcurrent protective device.

1.5 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
3. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
2. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.

2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Panel front shall be fabricated so that the panel may be opened to access the breakers and also to allow access to breaker wiring without removal of the front.
3. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
4. Finishes:

a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.

5. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

B. Incoming Mains Location: As required and as shown on plans.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear load. Where shown on plans.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.

3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Compression Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than [36 inches (914 mm)] high, provide two latches, keyed alike.

2. Door or doors shall allow access to breakers dead front and also to the breaker wiring without removal of front.

D. Mains: As indicated.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Door shall be available to open over breaker lugs.

2.4 LOAD CENTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Mains: As indicated. On drawings.

C. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

D. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.5 ELECTRONIC-GRADE PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1; with factory-installed, integral TVSS; labeled by an NRTL for compliance with UL 67 after installing TVSS.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

E. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

F. Buses:

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
2. Copper equipment and isolated ground buses.

G. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, bolt-on, solid-state, parallel-connected, type, with sine-wave tracking suppression and filtering modules, short-circuit current rating complying with UL 1449, second edition, and matching or exceeding the panelboard short-circuit rating, redundant suppression circuits, with individually fused metal-oxide varistors.

1. Accessories:

a. Fuses rated at 200-kA interrupting capacity.
b. Fabrication using bolted compression lugs for internal wiring.
c. Integral disconnect switch.
d. Redundant suppression circuits.
e. Redundant replaceable modules.
f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
g. LED indicator lights for power and protection status.
h. Audible alarm, with silencing switch, to indicate when protection has failed.
i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
j. Four digit, transient-event counter set to totalize transient surges.

2. Peak Single-Impulse Surge Current Rating: 120 kA per mode/240 kA per phase.
3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.

a. Line to Neutral: 70,000 A.
b. Line to Ground: 70,000 A.
c. Neutral to Ground: 50,000 A.

4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
5. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 208Y/120 -V, three-phase, four-wire circuits shall be as follows:

a. Line to Neutral: 800 V for 480Y/277 400 V for 208Y/120.
b. Line to Ground: 800 V for 480Y/277 400 V for 208Y/120.

c. Neutral to Ground: 800 V for 480Y/277 400 V for 208Y/120.

6. Protection modes and UL 1449 SVR for 240-, 480-, or 600-V, three-phase, three-wire, delta circuits shall be as follows:

a. Line to Line: 2000 V for 480 V 1000 V for 240 V.
b. Line to Ground: 1500 V for 480 V 800 V for 240 V.

2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Thor.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip;400A and Larger and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d.

3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 or NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Retain option in first paragraph below if retaining "Load Balancing" Paragraph in "Adjusting" Article.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

I. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: For distribution panels label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Wall-switch and occupancy sensors.
3. Communications outlets.

B. Related Sections include the following:

1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Field quality-control test reports. Submitted prior to final punch list.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

E. Submit on digital wiring analyzer to be used to test voltage drop on receptacles.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
5. Hubbell Building Automation Systems.

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; GF20.
    b. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
    d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

C. Key-Operated Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 2221L.
    b. Hubbell; HBL1221L.
    c. Leviton; 1221-2L.
    d. Pass & Seymour; PS20AC1-L.

3. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.5 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 600 W; dimmers shall require no derating when ganged with other devices.
2. Dimmers greater than 600 watts shall have cooling fans with back box to match spacing.

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.6 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 6111 for 120 V, 6117 for 277 V.
    b. Hubbell; WS1277.
    c. Leviton; ODS 10-ID.
    d. Pass & Seymour; WS3000.
    e. Watt Stopper (The); WS-200.

3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

2.7 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic 0.035-inch- (1-mm-) thick Material for Unfinished Spaces: Galvanized steel.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant , die-cast aluminum with lockable cover.

2.8 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power SystemAs selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up ,

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings. Verify with Architect and Owner that all floor outlets and service poles are coordinated with furniture to be installed.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable. Report voltage drop on receptacle circuit as follows: Receptacle circuit L-1 (Typical) Voltage measured = 119V. All receptacle circuits shall be reported. Final close out of project will not be attained without report.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

END OF SECTION 262726

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SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers and motor-control centers.
2. Spare-fuse cabinets.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Fuse sizes for elevator disconnect switches.

B. Operation and Maintenance Data: For fuses to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Current-limitation curves for fuses with current-limiting characteristics.
2. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses:
    a. Three spare of each size and type
    b. Fuse cabinet sized to contain spare fuse stock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified.

2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay; Class J, time delay.
2. Feeders: Class L, time delay Class RK1, time delay.
3. Motor Branch Circuits: Class RK.
4. Other Branch Circuits: Class RK1, time delay; Class J, time delay.
5. Control Circuits: Class CC, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide or product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.

3. For isolated grounded systems Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

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SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboards used for lighting control.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.

4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) of the plane of the luminaires.
4. Structural members to which equipment and or luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

    a. Other luminaires.
    b. Air outlets and inlets.

c. Speakers.
d. Sprinklers.
e. Access panels.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Recessed Fixtures: Comply with NEMA LE 4.

E. Bulb shape complying with ANSI C79.1.

F. Lamp base complying with ANSI C81.61 or IEC 60061-1.

G. CRI of minimum 80. CCT of 4100 K.

H. Rated lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 120 V ac.

1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

L. Housings:

1. Extruded-aluminum housing and heat sink.
2. Painted finish.

2.2 CYLINDER

A. Minimum 575 lumens. Minimum allowable efficacy of 80 lumens per watt.

B. With integral mounting provisions.

2.3 DOWNLIGHT

A. Minimum 1,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

B. Universal mounting bracket.

C. Integral junction box with conduit fittings.

2.4 HIGHBAY, LINEAR

A. Minimum 10,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

2.5 HIGHBAY, NONLINEAR

A. Minimum 10,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

B. Universal mounting bracket.

C. Integral junction box with conduit fittings.

2.6 RECESSED LINEAR

A. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

B. Integral junction box with conduit fittings.

2.7 STRIP LIGHT

A. Minimum 750 lumens. Minimum allowable efficacy of 75 lumens per watt.

B. Integral junction box with conduit fittings.

2.8 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Prismatic Acrylic.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Powder-Coat finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.9 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.10 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68) mm.

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. [Attached to structural members in walls] [Attached to a minimum 20 gauge backing plate attached to wall structural members] [Attached using through bolts and backing plates on either side of wall] <Insert means of attachment>.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with 4 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to 120 inches (6 m) in length.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Fixture Lighting Controls."

B. Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

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SECTION 265619 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboard-based lighting control.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.

4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project, IES LM-79, IES LM-80.

    a. Manufacturer's Certified Data: Photometric data certified by manufacturer?s laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture indicated with factory-applied finish.

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

F. Source quality-control reports.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

F. Mockups: For exterior luminaires, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61, or IEC 60061-1.

F. Bulb shape complying with ANSI C79.1.

G. CRI of minimum 80. CCT of 3000 K.

H. L70 lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 120 V ac.

L. In-line Fusing: Separate in-line fuse for each luminaire.

M. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

N. Source Limitations: Obtain luminaires from single source from a single manufacturer.

O. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE TYPES

A. Area and Site:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Luminaire Shape: Square.
3. Mounting: Pole with extruded-aluminum arm, 11 inches (280 mm) in length.
4. Luminaire-Mounting Height: As per drawings.
5. Distribution: As per drawings.
6. Housings:

    a. Extruded-aluminum housing and heat sink.
    b. Clear powder-coat painted finish.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch ((3.175 mm)) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.4 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

    a. Color: As per Architect selection.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: As selected by Architect from manufacturer's full range.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, and canopy ceilings and overhang ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 4 inches (100 mm) above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.5 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

    a. IES LM-5.
    b. IES LM-50.
    c. IES LM-52.
    d. IES LM-64.
    e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.9 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265619

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Magnetic door holders. (where indicated or required)
7. Remote annunciator.
8. Addressable interface device.
9. Digital alarm communicator transmitter.
10. System printer.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

B. Provision for future addition of fire alarm system expansion.

1.5 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified fire-alarm technician, Level III minimum.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include floor plans to indicate final outlet locations showing address of each addressable device. (Show size and route of cable and/or conduits. where required)

D. Qualification Data: For qualified Installer.

E. Field quality-control reports.

F. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

a. Frequency of testing of installed components.
b. Frequency of inspection of installed components.
c. Requirements and recommendations related to results of maintenance.
d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system. (for renovations or existing systems)

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FMG-approved alarm company.

1.7 SEQUENCING AND SCHEDULING

A. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Audible and Visual Notification Appliances: One of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
   1. NOTIFIER; a Honeywell company.
   2. Siemens Building Technologies, Inc.; Fire Safety Division.
   3. Silent Knight; a Honeywell company.
   4. SimplexGrinnell LP; a Tyco International company.
   5. Edwards System Tehnology.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

   1. Manual stations.
   2. Heat detectors.
   3. Smoke detectors.
   4. Duct smoke detectors.
   5. Verified automatic alarm operation of smoke detectors.

B. Fire-alarm signal shall initiate the following actions:

   1. Continuously operate alarm notification appliances.
   2. Identify alarm at fire-alarm control unit and remote annunciators.
   3. Transmit an alarm signal to the remote alarm receiving station.
   4. Unlock electric door locks in designated egress paths.
   5. Close smoke dampers in air ducts of designated air-conditioning duct systems.
   6. Record events in the system memory.

C. System trouble signal initiation shall be by one or more of the following devices and actions:

   1. Open circuits, shorts, and grounds in designated circuits.
   2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
   3. Loss of primary power at fire-alarm control unit.
   4. Ground or a single break in fire-alarm control unit internal circuits.
   5. Abnormal ac voltage at fire-alarm control unit.
   6. Break in standby battery circuitry.
   7. Failure of battery charging.
   8. Abnormal position of any switch at fire-alarm control unit or annunciator.

D. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. System shall be expandable to monitor 50% future input and output.

2. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder.

3. Addressable initiation devices that communicate device identity and status.

a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.

4. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 1, 2 or 3 line(s) of 40 or80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory and print out the final adjusted values on system printer.

D. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

E. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

F. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.

B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:
   a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted or ceiling mounted, as shown on plans.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

2.8 MAGNETIC DOOR HOLDERS (As Scheduled in Door Hardware)

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.9 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to power module shunt trip for power shutdown.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.

3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

D. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

F. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling or on ceiling grid. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling or on ceiling grid.

H. Device Location-Indicating Lights: Locate in public space near the device they monitor.

I. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

J. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

D. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

SECTION 310513-SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

B. Related Sections:
   1. Section 310513 - Aggregates for Earthwork.
   2. Section 320516 - Aggregates for Exterior Improvements.
   3. Section 312213 - Rough Grading.
   4. Section 312323 - Backfill.
   5. Section 312317 - Trenching.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material:Perform in accordance with ASTM D698.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials subsoil and topsoil not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00-SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris.
   2. Removing designated trees, shrubs, and other plant life.
   3. Removing abandoned utilities.
   4. Excavating topsoil.

B. Related Sections:
   1. Section 312213 - Rough Grading.
   2. Section 312318 - Rock Removal.

PART 2 EXECUTION

2.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify waste area for placing removed materials.

2.2 PREPARATION

A. Call Local Utility Line Information not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

2.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping

C. Protect bench marks, survey control points, and existing structures from damage or displacement.

2.4 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs within marked areas. Remove stumps.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

2.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

C. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

D. Do not burn or bury materials on site. Leave site in clean condition.

2.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.

D. Remove excess topsoil not intended for reuse, from site.

END OF SECTION

SECTION 311100 - CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 GENERAL DESCRIPTION OF WORK

A. Cleaning and grubbing on project site of trees, stumps, brush, roots, vegetation, logs rubbish and other objectionable matter within limits described in specifications or as shown on plans.
B. Cleaning and grubbing shall be in advance of grading operation except that in cuts over 3 feet in depth, grubbing may be done simultaneously with excavation, provided objectionable matter is removed as specified.
C. Dispose of all debris resulting from clearing and grubbing work.

1.2 PROTECTION OF ADJACENT WORK:

A. Protect all areas outside indicated construction areas.

B. Protect existing improvements, adjacent property, utilities and other facilities, and trees and plants not to be removed from injury or damage.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Provide materials required to perform work as specified.

PART 3 - EXECUTION

3.1 CLEARING:

A. Clear all areas covered by dikes, roads, structures and embankments within project limits unless otherwise shown in plans.

B. Remove all saplings, brush, down-timber and debris unless shown or directed otherwise.

C. Use tree wound paint to treat scars, gashes or limbs stubs on trees not removed.

3.2 GRUBBING:

A. Trees, stumps, root systems, rocks and other obstructions shall be removed to the depths shown when they fall within the construction templates for the following items:

1.	Footings	18-inches below bottom of footing.
2.	Sidewalks (or other types of walks)	12-inches below bottom of walk.
3.	Roadways or Streets	18-inches below bottom of subgrade
4.	Parking Areas	18-inches below bottom of subgrade
5.	Grassed Areas	18-inches below top soil
6.	Fills	24-inches below bottom of fill

B. Blasting not permitted.

3.3 REMOVAL OF DEBRIS AND CLEANUP

A. Burning is not permitted.

B. Dispose of all waste materials not burned by removal from site.

C. Materials cleared and grubbed shall be the property of the Contractor and shall be his responsibility for disposal.

END OF SECTION 311100

SECTION 312100 - EXCAVATION, BACKFILL AND GRADING FOR SITE WORK OUTSIDE OF BUILDING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Grading and earthwork which occurs in areas other than under structures, under paving, or trenching for utilities.

B. Earthwork consists of operations required for the excavation of materials on site; excavation of borrow material from designated areas; compaction of natural or improved sub-grades: finish grading; disposal of excess or unsuitable materials; and other required operations. Earthwork shall conform with dimensions and typical sections shown, and within lines and grades established on Drawings.

1.2 RELATED SECTIONS:

A. Trench Excavation, Backfill and Compaction- Section 312200.

1.3 REFERENCES:

A. ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft^3).

B. ASTM D4972 - pH of Soil.

C. ASTM G57 - Field Measurement of Soil Resistivity Using the Wenner Four Electrode Method.

D. ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.4 EXISTING UTILITIES:

A. Where pipes, ducts and structures are encountered in the excavation but are not shown on the Drawings, immediately notify the ENGINEER.

1.5 DEFINITIONS:

A. Classification: Earthwork materials are classified in accordance with definitions in this Article.

B. Topsoil: Top 8 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes roots and other vegetation.

C. General Site Fill: Suitable, clean material excavated on-site or off-site may be used as fill material. Suitable material shall consist of clay soils classified as CH according to the unified soil classification system. Clay soil used as fill shall have a liquid limit of less than 55 and a Plasticity Index comparable with on-site soils.

D. Select Fill: Select fill material, as required for construction, defined in the Geotechnical Report, shall consist of inorganic silty or sandy clay.

E. Subgrade: Consists of that portion of the surface on which a compacted fill, backfill or topsoil is placed.

F. Borrow: Material taken from on-site designated areas or approved off-site sources to make up any deficit of excavated material. Obtain from area that is normally dry and well drained. Borrow does not include top soil.

G. Finish Grading: Operations required for smoothing disturbed areas that are not overlaid with pavement.

H. Excavation: Excavation of every description and of whatever substances encountered within the limits of the project to the lines and grades indicated on the Drawings.

I. Compaction: Compaction of soil materials shall be measured as a percent of Standard Proctor density as determined by the ASTM D698.

PART 2 - PRODUCTS

2.1 SELECT FILL:

A. Source: Obtain select fill material from required excavation, or if excavated material is not adequate, from borrow areas approved by the Geotechnical ENGINEER. Material from source shall be tested for compliance with project requirements and approved by the Owner and Testing Laboratory.

B. Suitability: Use the best material available from excavation or borrow, suitability of select fill is subject to the ENGINEER’S approval.

C. Quality: Select fill material must be free of rock and clay lumps or excessive silts. Do not use soil containing brush, roots, sod or similar organic materials.

D. Characteristics: Select fill material shall consist of inorganic silty or sandy clay. Additional select fill requirements are described in Geotechnical Report.

2.2 FILL AND BACKFILL UNDER TOPSOIL:

A. Source: Obtain site fill from required excavation or, if excavated material is not sufficient, from borrow areas approved by the ENGINEER.

B. Suitability: Use the best material available from excavation or borrow. Suitability of fill material is subject to the Testing Laboratory\Engineer's approval.

C. Quality: Fill material shall be free of excessive silts. Do not use soil containing brush, roots, sod or similar organic materials.

D. Characteristics: Fill material shall have a plasticity index between 6 and 25, inclusive, and shall generally be of similar character to that of existing soil at the site.

PART 3 – EXECUTION

3.1 STRIP AND STOCKPILE:

A. Remove topsoil at all non-paved areas where excavation of topsoil is required or where fill material will be added for site grading. Remove top 6 inches of topsoil where necessary and stockpile on the property as directed by the Owner. Protect stockpiled topsoil from other excavated materials, dumping of unwanted material, dumping by the public, and erosion. Upon completion of rough grading, replace topsoil in 4-inch minimum layer to finish grade elevations as shown on the grading plan.

3.2 EXCAVATION:

A. Objective: As shown on the Drawings, excavate to lines, grades and elevations required for subsequent construction. All excavation shall be made in such manner as to permit all surfaces to be brought to final line and grade within plus or minus 0.1 foot. Over excavation shall be restored by the Contractor at his own expense. Finished grades consistently high or low will not be acceptable and shall be corrected by the Contractor at his expense and no additional cost to the Owner.

B. Drainage: During excavation, maintain grades as required to provide positive drainage away from structures; or, as directed by the Engineer, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.

C. Stockpiling: If at time of excavation it is not possible to place material in the proper section of permanent construction, stockpile the material in Owner or Architect approved areas for later use.

D. Stone or Rock: Stone or rock fragments greater than 6" will not be allowed in fills or embankments. Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.

E. Dressing: Uniformly dress cut and fill slopes to slope, cross section and alignment, as shown.

3.3 TREATMENT OF SUBGRADES:

A. All topsoil and vegetation shall be stripped from the ground surface and stockpiled, exposing sound undisturbed subgrade soils.

B. After stripping the topsoil in areas to receive fill or cut areas, the exposed ground surface shall be scarified to a depth of 6 inches, the moisture adjusted, and then recompact to a density of 95 to MIN. percent of the maximum density as obtained in the Standard Proctor Compaction Test (ASTM D698), at a moisture content between minus 1 to plus 3 percent of optimum. Any soft or compressible areas detected during the recompaction process shall be undercut such that sound subgrade soils are exposed and recompacted. Site excavated or select fill shall then be used to bring all areas to grade. Allow for placement of minimum 4-inch layer of top soil in areas not covered by building or pavement.

C. Finished subgrade shall be inspected by Testing Laboratory for determination that subgrade meets requirements of Contract Documents.

3.4 PLACING FILL AND BACKFILL:

A. Examination of Subgrade: Do not place fill on any part of the subgrade until the subgrade preparation has been accepted by the Engineer.

B. Removing Debris: During the dumping and spreading process, remove all roots, stones and debris that are uncovered in the fill material.

C. Spreading Fill and Backfill: After dumping, spread the material in horizontal layers over the entire fill area. The thickness of each layer before compaction shall not exceed 8 inches unless otherwise directed by the Engineer. Maintain positive drainage throughout construction. The combined excavation and fill placing operation shall be such that the material when compacted in the fill will be blended sufficiently to secure the best practicable degree of compaction. The suitability of the materials shall be subject to testing by the Testing Laboratory and approval of the Engineer. After each layer of fill has been spread to the proper depth, it shall be thoroughly manipulated with a disc plow or other suitable and approved equipment until the material is uniformly mixed, pulverized and brought to a uniform approved moisture content.

D. Attaining Proper Bond: If, in the opinion of the Testing Laboratory, the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.

E. Place materials to proper elevation allowing for depth of topsoil furnished under this Contract.

3.5 MOISTURE CONTROL:

A. Intent: Developing the maximum density obtainable with the natural moisture of the material is preferred. However, the moisture content shall not vary from the optimum, as determined by ASTM D698, by more than minus 1 to plus 3 percent of optimum.

B. Adjustment: If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by discing or harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other Engineer approved method.

3.6 COMPACTION:

A. Rough Grade: Compact each layer of fill material with suitable equipment as necessary to secure 95% to 98% Standard Proctor Density (ASTM D698) within the specified range of the moisture content.

B. Finish Grade: Place and lightly compact topsoil to achieve finish grades.

3.7 DISTRIBUTION OF TOPSOIL:

A. Perform rough grading and topsoil/finish grading work.

B. Preparation:

1. Prior to placing topsoil, scarify the subgrade to a depth of 2 inches to provide effective bonding of the topsoil with the subgrade.
2. Shape all areas designated for grading, including cut and fill areas, to receive a minimum of 4 inches of topsoil

C. Placement:

1. Do not haul or place wet topsoil. Also prohibited is placement of topsoil on a subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
2. Distribute topsoil uniformly and spread evenly. Correct irregularities in the surface to prevent formation of depressions where water could stand.
3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth and suitable for lawn planting.
4. Lightly compact topsoil to obtain proper bond with previously placed or prepared material.

D. Maintenance: Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement; then replace topsoil.

3.8 MATERIAL DISPOSAL:

A. Excess Excavation Material (soil material free of trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has been accepted by the Geotechnical Engineer): Remove excess excavated material from the construction site or place on the property as directed by the ENGINEER.

B. Waste Material (soil material including trees, stumps, logs, brush, roots, rubbish and other objectionable matter which has not been accepted by the Geotechnical Engineer): Remove waste material from the project site before Final Inspection. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site. All costs associated with waste material removal and disposal shall be paid for by the Contractor.

PART 4 - TESTING

4.1 PROCEDURE

A. The testing laboratory will make tests of in-place density in accordance with ASTM Standards. Backfill operations will be monitored continuously by the testing laboratory at structures. It will be the responsibility of the CONTRACTOR to notify the testing laboratory before backfill operations begin.

END OF SECTION 312100

SECTION 312200 - TRENCH EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK

A. Excavation, shoring, dewatering, pipe bleeding, trench backfill, compaction, grading and cleanup of all pipeline trenching for the project.

B. All work must be done in accordance with these specifications and the safety requirements of the State and OSHA Standards.

1.2 JOB CONDITIONS

A. Site Acceptance
   1. Accept site in condition existing during Contract time frame.
   2. Ground water/surface water found during construction are conditions of the contract and responsibility of Contractor.

B. Adverse Weather
   1. Place no backfill that is excessively wet or frozen.
   2. Place no backfill in excessively wet or frozen trenches.

PART 2 – PRODUCT

2.1 MATERIAL CLASSIFICAITONS

A. Materials for backfill shall be classified for the purpose of quality control in accordance with the Unified Soil Classification Symbols as defined in ASTM D 2487. Material use and application is defined in utility installation specifications and Drawings either by class, as described in Paragraph 2.10B, or by product descriptions, as given in Paragraph 2.02.
   Class Designations Based on Laboratory Testing:
   1. Class I: Well-graded sands and gravels, gravel-sand mixtures, crushed well-graded rock, little or no fines (GW,SW)
   2. Plasticity Index: Non-plastic
   3. Gradation: D60/D10 – greater than 4 percent. Amount passing No. 200 $\leq$ 5%.
   4. Class II: Poorly-graded gravels and sands, silty sands and gravels, little to moderate fines (GM, GP, SP, and SM)
   5. Plasticity Index: Non-plastic to 4
   6. Gradation (GP, SP): Amount passing No. 200 Sieve – less than 5%.
   7. Gradation (GM, SM): Amount passing No. 200 Sieve – 12% to 50%
   8. Class III: Clayey gravels and sands, poorly graded mixtures of sand, gravel, and clay (GC, SC)
      a. Plasticity Index

2.2 PIPE BEDDING AND BACKFILL

A. The type of bedding shall be stated on the Plans or in the Specification. Determination of source of materials for bedding and backfill to meet the stated conditions shall be responsibility of Contractor, but use of such materials shall be subject to approval of Engineer.

B. Excavated Material Backfill
   1. Excavated material may be used in the trench backfill, provided that all hard rock and stones having any dimensions greater than 6" and frozen earth debris and roots larger than 2" are removed for the initial backfill. Plasticity Index shall be less than 30. Excavated backfill material must be approved by Engineer for bedding material.

C. Select Backfill
   1. Select Backfill shall be gravel, fine rock cuttings, sand, sandy loam or loam free from excessive clay. Rock cuttings shall have no dimensions greater than 2 inches. Plasticity Index shall be between 7 and 22. Select backfill must be approved by Engineer.

D. Sand Backfill
   1. Sand backfill shall be clean, hard, durable, uncoated grains, free from lumps and organic material. All materials must pass a No. 8 Sieve.

E. Granular Backfill
   1. Granular backfill shall be free flowing, such as sand or hydraulically grade stone fines, or mixed sand and gravel, or sandy loam. The material shall be free from lumps, stones over 2 inches in diameter, clay and organic matter.

F. Controlled Density Fill

   1. Use high slump mixture of portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal. Provide mixture with minimum 28-day compressive strength of 70 psi with no measurable shrinkage or surface settlement.

2.3 CRADLING ROCK

A. Use crushed rock or stone with 70-100% passing 1> inch sieve and no more than 50% passing 1 inch sieve.

2.4 SHEETING, SHORING AND BRACING

A. Use sound timber or structural steel.

B. Use shapes and sizes as required.

PART 3 - EXECUTION

3.1 GENERAL

A. Dewatering

   1. Execute work "dry". No pipe or conduits shall be laid or concrete poured on excessively wet soil.
   2. Prevent surface water from flowing into excavation.
   3. Provide equipment for handling water encountered as required. Obtain approval of proposed method of dewatering.
   4. No Sanitary sewer shall be used for disposal of trench water.

B. Protection of Existing Utilities:

1. Notify all utilities of location and schedule of work.
2. Locations and elevations of utilities shown on plans are to be considered approximate only. Notify utility and Engineer of conflicts between existing and proposed facilities.
3. Repair, relay or replace existing utilities damaged, destroyed or disrupted during work. Unless specified otherwise, replacement will be at the Contractors expense.

C. Sheeting, Shoring and Bracing

1. Provide as necessary, to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.
2. Leave Sheeting and shoring in place where removal might cause damage to work or otherwise indicated on drawings.
3. When movable trench shield is used below spring line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.

D. Changes in Grade

1. Grades may be adjusted 1.5 feet (plus or minus) from plan grades to suit unforeseen construction conflicts or conditions with approval of Engineer.
2. No additional compensation will be made for such changes.

3.2 EXCAVATION AND TRENCHING

A. General

1. Method of excavation at Contractor's option.
2. Excavate by hand under tree roots 3 inches and larger, and under and around structures and utilities.
3. Stockpile and replace topsoil to a minimum of 4-inches for surface restoration in grassed or agricultural areas.

B. Trench Characteristics

1. Depth
   a. As indicated for pipe installation to lines and grades required with proper allowance for thickness of pipe and type of bedding specified or indicated.
2. Width
   a. Keep width of trench as narrow as possible and yet provide adequate room for backfilling and jointing.
   b. Maximum width as follows:

Pipe Size Inches	Maximum Trench Width
4	2-feet 0-inches
6	2-feet 0-inches
8	2-feet 4-inches
10	2-feet 4-inches
12	2-feet 6-inches
15	2-feet 9-inches

18	3-feet 0-inches
Over 18	Pipe O.D. + 12-inches

3. Trench walls must be vertical below top of pipe and may be vertical or sloped above pipe to conform to excavating codes.
4. Provide bell holes for each pipe joint where pipe bears on undisturbed earth.
5. Trench bottom shall be free of large stones and other foreign material.

3.3 SOFT, SPONGY OR UNSTABLE MATERIALS

A. Stop work and notify Engineer.

B. Perform remedial work as directed.

C. If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

3.4 ROCK EXCAVATION

A. Excavate any rock to maintain minimum 6-inch clearance around pipe.

B. Dispose of rock material not suitable for backfill as directed by Engineer.

C. Use of explosives not permitted without prior written authorization from owner and Engineer.

D. Provide Special Hazard Insurance covering liability for blasting operations.

3.5 BEDDING

A. Place after bottom of trench has been excavated to proper depth and grade.

B. Place, compact and shape bedding material to conform to barrel of pipe to insure continuous firm bedding for fill length of pipe.

C. Provide bedding as described in following table unless indicated otherwise on Plans or in Special Conditions.

Pipe Material	Minimum Bedding Class
1. Vitrified Clay Pipe	Class C*
2. Non-reinforced Concrete Pipe	Class C*
3. Reinforced Concrete Pipe	Class D*
4. Ductile Iron Pipe	Class D*
5. Steel Cylinder	Class C*
6. Flexible or Composite Pipe (PVC)	Class 1**

*Refers to standard detail, "Pipe Envelope Requirements"
**Refers to standard detail, "Bedding Detail"

3.6 TRENCH BACKFILL

A. Use excavated material for backfill unless otherwise specified.

B. Use Sand Backfill for all trenches within 5 feet of buildings and beneath walks, parking areas, paved streets or existing exposed utilities, unless otherwise specified in the plans.

C. Initial Backfill

1. Place after pipe has been bedded and checked for alignment, grade and internal obstructions.
2. Carry out in an orderly fashion after authorization to cover pipe has been given.
3. Allow no more than 300 feet of trench to be open at one time.
4. Do not backfill until concrete or mortar has sufficiently cured.
5. Record location of connections and appurtenances before backfilling.
6. Place by hand and hand tamp to not less than 12-inches above top of pipe, in approximately 4-inch layers.
7. Backfill simultaneously on both sides of pipe to prevent displacement.
8. Place cushion of 4-foot backfill above pipe envelope before using heavy compacting equipment.

D. Subsequent Backfill

1. Place backfill into trench at an angle so that impact on installed pipe is minimized.
2. Compaction of all backfill material shall be performed in an manner that shall not crack, crush, and/or cause the installed pipe to be moved from the established grade and/or alignment.
3. Area under or within 5-feet of pavement; and under or within 2-feet of utilities, buildings, or walks shall be mechanically compacted to the top of the subgrade in 6-inch lifts to a minimum of 95% Standard Proctor Density.
4. Areas not subject to vehicular traffic shall be backfilled in layers not more than 12-inches in depth.
5. Compaction method is at discretion of Contractor with following exceptions:
   a. If in Owner's opinion compaction method presents potential damage to pipe, it will not be allowed.
   b. Compaction of any backfill material by flooding or jetting is not allowed.
6. Mound excavated materials no greater than 6-inches in open areas only.
7. Fill upper portion of trench with topsoil as specified hereinbefore.

E. Controlled Density Fill

1. Use where shown on plans.
2. Provide suitable forms to limit volume of control density fill material.
3. Prevent flow of material into existing drain lines.
4. Protect exposed utility lines during placement.
5. Place material in accordance with suppliers' written recommendations unless directed otherwise by Engineer

3.7 EXCESS MATERIAL

A. Waste of excess excavated material shall be the responsibility of the Contractor.

3.8 TESTING

A. Unless specified elsewhere, testing will be responsibility of Owner.

B. Standard Proctor Density

1. ASTM D698.
2. One (1) required for each type of material encountered.

C. In Place Density

1. ASTM D1556 (Sand Cone)
2. ASTM D2167 (Balloon)
3. ASTM D3017 (Nuclear)

D. One (1) test per each 400 cubic yards of backfill placed.

END OF SECTION 312200

SECTION 312213-ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, compacting site for site structures, building pads.

B. Related Sections:
1. Section 310513 - Soils for Earthwork: Soils for fill.
2. Section 310516 - Aggregates for Earthwork: Aggregates for fill.
3. Section 311000 - Site Clearing: Excavating topsoil.
4. Section 312316 - Excavation and Fill: Building excavation.
5. Section 312318 - Rock Removal.
6. Section 312323 - Backfill: General building area backfilling.
7. Section 312317 - Trenching: Trenching and backfilling for utilities.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

PART 2 EXECUTION

2.1 PREPARATION

A. Call Local Utility Line Information service not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Protect utilities indicated to remain from damage.

D. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

2.2 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place fill material in continuous layers and compact as required.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

2.3 FIELD QUALITY CONTROL

A. Perform in place compaction tests in accordance with the following:
   1. As required by geotechnical engineer.

END OF SECTION

SECTION 31 23 16-EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Soil densification.
2. Excavating for building foundations.
3. Excavating for slabs-on-grade.
4. Excavating for site structures.

B. Related Sections:
1. Section 310513 - Soils for Earthwork: Stockpiling excavated materials.
2. Section 310516 - Aggregates for Earthwork: Stockpiling excavated materials.
3. Section 312213 - Rough Grading: Topsoil and subsoil removal from site surface.
4. Section 312318- Rock Removal: Removal of rock during excavating.
5. Section 312323- Backfill.
6. Section 312317 - Trenching: Excavating for utility trenches.

1.2 REFERENCES

A. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. Local utility standards when working within 24 inches of utility lines.

PART 2 EXECUTION

2.1 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work.

B. Excavate subsoil to accommodate building foundations, slabs-on-grade.

C. Excavate to working elevation for piling work.

D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 02320 and Section 02324.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Trim excavation. Remove loose matter.

G. Notify Architect/Engineer of unexpected subsurface conditions.

H. Correct areas over excavated with structural fill.

I. Remove excess and unsuitable material from site.

J. Repair or replace items indicated to remain damaged by excavation.

2.2 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 312500 - EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1-GENERAL

1.1 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to provide erosion and sediment control for the duration of the construction period including furnishing, installing and maintaining erosion and sediment control structures and procedures and the proper removal when no longer required.

The intent of this specification is to provide guidelines for the Contractor to adhere to all State, Federal, and Local environmental regulations. It is also the intent to provide preventive measures to keep sediment from entering any storm water system, including open channels. It is the Contractor's responsibility to adhere to all State, Federal and Local requirements. While the Owner may require the Contractor to install erosion control devices during construction, this will in no way relieve the Contractor of his responsibility.

1.2 QUALITY ASSURANCE

A. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Plans are not represented as being comprehensive, but rather to convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.

B. Erosion control measures shall be established at the beginning of construction and maintained during the entire length of construction. On-site areas which are subject to severe erosion and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive additional erosion control measures as directed by the Owner or the Engineer.

C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time and to minimize the time of exposure.

D. Surface water runoff originating upgrade of exposed area shall be controlled to reduce erosion and sediment loss during the period of exposure.

E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving ditch or stream, the Contractor shall install measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream as directed by the Owner or the Engineer.

F. All land-disturbing activities shall be planned and conducted so as to minimize off-site sedimentation damage.

G. The Contractor shall be responsible for periodically cleaning out and disposing of all sediment once the storage capacity of the drainage feature or structure receiving the sediment is reduced by one-half. The Contractor shall also be responsible for cleaning out and disposing of all sediment at the time of completion of the Work.

1.3 SUBMITTALS

Submittals shall be in accordance with Section 013300, SUBMITTALS, and shall include:

1. Manufacturer's Literature: Descriptive data of installation methods and procedures.
2. Certificates: Manufacturer's certification that materials meet specification requirements.

1.4 JOB CONDITIONS; CODES AND ORDINANCES

Comply with the local codes and ordinances. If local codes and ordinances require more stringent or additional erosion and sediment control measures during construction, Contractor shall provide such measures.

PART 2 - PRODUCTS

2.1 MATERIALS

A. STRAW BALES: Straw bales shall weigh a minimum of fifty (50) pounds and shall be at least 30" in length. Bales shall be composed entirely of vegetable matter and be free of seeds. Binding shall be either wire or nylon string, jute or cotton binding is unacceptable. Bales shall be used for not more than three months before being replaced. However, if weather conditions cause biological degradation of the straw bales, they shall be replaced sooner than the three month time period to prevent a loss of structural integrity of the dike.

B. SILT FENCE: Silt fence fabric shall be a nylon reinforced polypropylene fabric which has a built-in cord running the entire length of the top edge of the fabric. The fabric must meet the following minimum criteria:

Tensile Strength, ASTM D4632	90 lbs.,
Puncture Rating, ASTM D4833	60 lbs.,
Mullen Burst Rating, ASTM D3786	200 psi,
Apparent Opening Size, U.S. Sieve No.	40

Silt fence shall be "Enviro Fence" preassembled silt fence, AMXCO Silt Stop prefabricated silt fence, AMOCO Style 2155 preassembled silt fence or approved equal.

C. SILT FENCE POSTS: A minimum 2" x 2" (nominal) x 54" pressure treated wood posts of Number 2 Grade southern yellow pine or approved equal.

D. SAND BAG: Sand bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%. Length shall be 24 to 30 inches, width shall be 16 to 18 inches and thickness shall be six (6) to eight (8) inches and having an approximate weight of 40 pounds. Sand bags shall be filled with coarse grade sand, free from deleterious material. All sand shall pass through a No. 10 sieve.

E. P.V.C. PIPE: Pipe shall be SDR-35 polyvinyl chloride having a minimum nominal internal diameter of 4". Pipes shall be sized for anticipated flows.

F. SOIL RETENTION BLANKET: Soil retention blankets shall consist of a geocomposite of excelsior or fiber blanket with an extruded plastic net attached to the tope side. The plastic net shall be photodegradable and the excelsior or fiber blanket shall be made smolder resistant without the use of

chemicals. Soil retention blankets shall be high velocity type to resist severe runoff. The soil retention blanket shall be one (1) of the following classes and types:

1. Class 1. "Slope Protection"
   (a) Type A. Slopes of 3:1 or flatter - Clay soils
   (b) Type B. Slopes of 3:1 or flatter - Sandy soils
   (c) Type C. Slopes steeper than 3:1 - Clay soils
   (d) Type D. Slopes steeper than 3:1 - Sandy soils

2. Class 2. "Flexible Channel Liner"
   (a) Type E. Short-term duration (Up to 2 Years)
   Shear Stress (t_D)< 1.0 lb./sq. ft.
   (b) Type F. Short-term duration (Up to 2 Years)
   Shear Stress (t_d) 1.0 to 2.0 lb./sq. ft.
   (c) Type G. Long-term duration (Longer than 2 Years)
   Shear Stress (t_d) > 2.0 to < 5.0 lb./sq. ft.
   (d) Type H. Long-term duration (Longer than 2 Years)
   Shear Stress (t_d) greater than 0 Equal to 5.0 lb./sq. ft.

The Contractor has the option of selecting an approved soil retention blanket provided that selection conforms to the following list of approved soil retention blankets for slope protection applications:

CLASS I. SLOPE PROTECTION

TYPE A: Slopes of 3:1 or Flatter-Clay Soils

Airtrol® ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards®
Contech Standards Plus®
Green Triangle Regular®
Green Triangle Superior®
GREENSTREAK® PEC MAT
Curlex®
North American Green® S150
North American Green® S75
North American Green® SC150
POLYJUTEÔ 407/GT
SOIL SAVER®
TerraJute®
Verdyol® ERO-MAT®
Xcel Regular®
Xcel Superior®

TYPE B: Slopes of 3:1 or Flatter-Sandy Soils

Contech Standards®
Contech Standards Plus®
GEOCOIR®/DEKOWE® 700
Green Triangle Superior®
Green Triangle Regular®

North American Green® S75
North American Green® SC150
North American Green® S150
POLYJUTEÔ 407/GT
TerraJute®
Verdyol® ERO-MAT®
Xcel Superior®
Xcel Regular®

TYPE C: Slopes Steeper than 3:1-Clay Soils

Airtrol®
ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards Plus®
Curlex®
Green Triangle Superior®
GREENSTREAK® PEC-MAT
North American Green® SC150
North American Green® S150
POLYJUTEÔ 407/GT
SOIL SAVER®
TerraJute®
Xcel Superior®

TYPE D: Slopes Steeper than 3:1-Sandy Soils

Contech Standards Plus®
GEOCOIR®/DEKOWE® 700
Green Triangle Superior®
North American Green® S150
North American Green® SC150
POLYJUTEÔ 407GT
TerraJute®
Xcel Superior®

CLASS II: FLEXIBLE CHANNEL LINER PROTECTION

PART 3 - EXECUTION

3.1 INSTALLATION

A. TEMPORARY STRAW BALE DIKE

1. Straw bales shall be embedded a minimum of 4" and securely anchored using 2" x 2" wood stakes driven through the bales into the ground a minimum of 6". Straw bales are to be placed directly adjacent to one another leaving no gap between them.
2. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale. Additional bales shall

be placed behind the first row where the bales abut each other. The additional bale is used to prevent unfiltered runoff from escaping between the bales.

3. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4" above ground level on the uphill side. Loose straw shall be scattered over the area immediately uphill from a straw barrier.

B. SILT FENCE

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. The Contractor shall excavate a 6" by 6" trench for site fence bedding along the lower perimeters of the site where necessary to prevent sediment from entering any drainage system. The Contractor shall install the silt fence in accordance with the manufacturer's recommendations and instructions. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence shall remain in place until the disturbed area is permanently stabilized. Silt fence should not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of 6" or installation of support post to depth of 12". Fabric shall overlap at abutting ends a minimum of 3' and shall be jointed such that no leakage or bypass occurs. If concentrated flow occurs after installation, corrective action must be taken such as placing rock berm in the areas of concentrated flow.

C. SAND BAG BERM

1. The purpose of a sandbag berm is to intercept sediment-laden water from disturbed areas such as construction in steam beds, create a retention pond, detain sediment and release water in sheet flow.
2. A temporary sand bag berm shall be installed across a channel or right of way in a developing or disturbed area and should be used when the contributing drainage area is greater than 5 acres. The berm shall be a minimum height of 18", measured from the top of the existing ground at the upslope toe to the top of the berm. The berm shall be sized to have a minimum width of 48" measured at the bottom of the berm and 18" measured at the top of the berm.
3. The sand bag berm shall be inspected after each rain. The sand bags shall be reshaped or replaced as needed during inspection. Additional inspections shall be made daily by the responsible party and when the silt reaches 6", the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The sand bag berm shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal must be done by hand.

D. SOIL RETENTION BLANKETS

1. A soil retention blanket (SRB) is a geotextile or biodegradable fabric placed over disturbed areas to limit the effects of erosion due to rainfall impact and runoff across barren soil. Soil retention blankets are manufactured by a wide variety of vendors addressing a wide variety of conditions such as vegetation establishment and high velocity flow. Blankets are used in areas which are difficult to stabilize such as steep slopes, drainage swales or high pedestrian traffic areas.
2. The soil retention blanket, whether installed as slope protection or as flexible channel liner, shall be placed within 24 hours after seeding or sodding operations have been completed, or as approved by the Engineer. Prior to placing the blanket, the area to be covered shall be relatively

free of all rocks or clods over 1-1/2" in maximum dimension and all sticks or other foreign material which will prevent the close contact of the blanket with the soil. The area shall be smooth and free of ruts and other depressions. If as a result of rain, the prepared bed becomes crusted or eroded or if any eroded places, ruts or depressions exist for any reason, the Contractor shall be required to rework the soil until it is smooth and to reseed or resod the area at the Contractor's expense.

Installation and anchorage of the soil retention blanket shall be in accordance with the manufacturer's recommendations.

E. PROTECTION OF BARE AREAS

1. Apply seeding and soil retention blanket to bare areas including new embankment areas, fills, stripped areas, graded areas or otherwise disturbed areas, which have a grade greater than 5% or which will be exposed for more than 30 days.
2. Bare working areas on which it is not practical or desirable to install seeding and soil retention blankets, as determined by the Engineer, such as areas under proposed building slabs, shall be temporarily sloped to drain at a minimum of 0.2% and a maximum of 5% grade. These areas shall then be "trackwalked" with a crawler dozer traveling up and down the slope to form the effect of small "terraces" with the tracks of the dozer. Apply a minimum of three (3) coverages to each area with the dozer tracks.
3. Route runoff from the areas through the appropriate silt fence system.
4. Protect earth spoil areas by "trackwalking" and silt fences.

F. INTERCEPTOR SWALE

1. Interceptor swales may have a v-shape or be trapezoidal with a flat bottom and side slopes of 3:1 or flatter. These are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. The outflow from a swale must be directed to a stabilized outlet or sediment trapping device. The swales should remain in place until the disturbed area is permanently stabilized.
2. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 6' per second and shall consist of a layer of crushed stone 3" thick, or flexible channel liner soil retention blankets. Stabilization shall extend across the bottom of the swale and up both sides of the channel to minimum height of 3" above the design water surface elevation based on a two year storm.
3. Interceptor swale shall be installed across exposed slopes during construction and should intercept no more than five (5) acres of runoff. Swales shall have a minimum bottom width of 2'-0" and a maximum depth of 1'-6" with side slopes of 3:1 or flatter. Swale must have positive drainage for its entire length to an outlet. When the slope exceeds 3%, or velocities exceed 4' per second (regardless of slope), stone stabilization is required. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary. Swales should be inspected on a weekly basis during wet weather and repairs should be made promptly to maintain a consistent cross section.
4. All trees, brush, stumps, obstructions and other material shall be removed and disposed of so as not to interfere with the proper functioning of the swale.
5. The swale shall be excavated or shaped to line, grade, and cross-section as required to meet criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.
6. All earth removed and not needed in construction shall be disposed of in an approved spoils site so that it will be conveyed to a sediment trapping device.

7. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device.
8. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.
9. Minimum compaction for the swale shall be 90% standard proctor.

G. LOCATION OF EROSION AND SEDIMENT CONTROL STRUCTURES

1. Locate erosion and sediment control structures as required to prevent erosion and removal of sediment from the project site. Silt fences shall be required for disturbed areas and soil stockpiles/spoil areas. Each silt fence installation shall have a minimum net length (exclusive of embedments into diversion dikes or other ineffective areas) of 25'. The runoff from a maximum of one (1) acre of disturbed area or soil stockpile/ spoil area shall be routed through any individual silt fence installation.
2. Install diversion dikes to divert runoff to the silt fence installation.
3. Install silt traps at the inlet (upstream) end of the drainage structures, including open channels, through which runoff from disturbed areas or soil stockpiles/spoil areas may drain.
4. Provide an overall erosion and sediment control system which protects disturbed areas and soil stockpiles/spoil areas. The system shall be modified by the Contractor from time to time to effectively control erosion and sediment during construction.

3.2 MAINTENANCE

A. Maintain erosion and sediment control structures and procedures in full working order at all times during construction. This shall include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment on a regular basis which accumulates in sediment control devices and place the material in approved earth spoil areas or return the material to the area from which it eroded.

B. Upon completion of construction, properly remove the temporary erosion and sediment control structures and complete the area as indicated.
C. Soil retention blankets will not require removal if installed on a finished graded area specified to receive seeding.

3.3 FIELD QUALITY CONTROL

In the event of conflict between the requirements and storm water pollution control laws, rules or regulations or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

END OF SECTION 312500

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SECTION 313116-TERMITE CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil treatment for termite control.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork: Backfill materials.
   2. Section 312316 - Excavation and Fill: Subgrade preparation.
   3. Section 033000 - Cast-In-Place Concrete: Slabs on grade and foundations placed over treated soil.

1.2 REFERENCES

A. Environmental Protection Agency:
   1. EPA FIFRA - Federal Insecticide, Fungicide and Rodenticide Act.

B. National Pest Management Association:
   1. NPMA WDO - Wood Destroying Organism Library.

1.3 SUBMITTALS

A. Product Data: Submit toxicants to be used, composition by percentage, dilution schedule, intended application rate. Include product label information.

B. Test Reports: Indicate regulatory agency approval reports.

C. Manufacturer's Application Instructions: Indicate caution requirements and in accordance with current product label of chosen pesticide.

D. Certify applications followed NPMA WDO for termite control or other regional location guidance.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record moisture content of soil before application, date and rate of application, areas of application, diary of toxicity meter readings and corresponding soil coverage.

B. Operation and Maintenance Data: Indicate re-treatment schedule.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the Work of this sectionand licensed in State of Texas.

1.6 SEQUENCING

A. Section 011000 - Summary: Work sequence.

B. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade in accordance with product label supplemented by the NPCA’s ARP for termiticiding or local requirements.

1.7 WARRANTY

A. Warranty: Include coverage for damage and repairs to building and building contents caused by termites. Repair damage. Re-treat where required.

PART 2 PRODUCTS

2.1 MATERIALS

A. Toxicant Chemical: EPA FIFRA approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

2.2 MIXES

A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements:Verification of existing conditions before starting work.

B. Verify soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

C. Verify final grading and excavation are complete.

3.2 APPLICATION

A. Apply toxicant at locations indicated in Schedule at end of section.

B. Apply extra treatment to structure penetration surfaces including pipe or ducts, and soil penetrations including grounding rods or posts.

C. Re-treat disturbed treated soil with same toxicant as original treatment.

D. When inspection or testing identifies presence of termites, re-treat soil and re-test.

3.3 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution Requirements: Protecting finished Work.

B. Do not permit soil grading over treated work.

3.4 SCHEDULES

A. Locations:
   1. Under Slabs-on-Grade.
   2. Both Sides of Foundation Surface.

END OF SECTION

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SECTION 315100 - TRENCH PROTECTION SYSTEM

PART 1 - GENERAL

1.0 THE GENERAL CONDITIONS, SPECIAL PROVISIONS and applicable requirements of DIVISION 1 - GENERAL REQUIREMENTS are hereby made a part of this section.

1.1 SCOPE: This section covers excavation and supporting systems for trenches necessary to protect the safety of workers. This specification shall govern for construction of all types of trenches except where the requirements of this section are explicitly revised or superseded by another section. Additional requirements as set forth by federal, state, and local government regulations will be applicable and must be followed. The contractor shall be responsible for the design, placement, and inspection of all trench safety systems in conformance with the Occupational Safety and Health Administration (OSHA) standards as contained in Subpart P, Part 1926, Title 29 of the Code of Federal Regulations (29 CFR 1926). Other OSHA construction standards shall also apply.

1.2 No boring logs are provided in these documents for subsurface conditions at the site. It is the Contractor's responsibility to determine and evaluate soil conditions at the site and design adequate trench safety systems. The Contractor will be responsible for detecting varying soil conditions which may be hazardous and take appropriate action. The contractor, at his expense, shall be responsible for obtaining any geological data required for his design of the trench safety system.

1.3 APPLICABILITY: These specifications apply to any trench excavation which is over five (5) feet in depth from the ground surface, or trench excavations that are less than five (5) feet in depth located in areas where unstable soil conditions are present (Ref. OSHA Safety and Health Regulations, Part 1926, Subpart P, Paragraph 29 CFR 1926.652, Subparagraph (a)).

1.4 LIABILITY: It is the Contractor's responsibility that all excavation work and site conditions are within the regulations as established by OSHA. Any property damage or bodily injury (including death) that arises from use of the trench safety systems, from the Contractor's negligence in performance of the contract work, shall remain the sole responsibility and liability of the Contractor.

1.5 EXISTING UNDERGROUND INSTALLATIONS: Underground installations are shown in approximate locations on the Drawings. It is the Contractors responsibility to verify the size, locations and elevations of all existing utilities in the construction area prior to commencement of excavation operations.

1.6 SURCHARGE LOADS: The Contractor's trench safety system shall be designed to take into account all surcharge loads including, but not limited to adjacent structures, contractor's equipment and heavily loaded truck traffic which will be routed near the work site.

PART 2 - MEASUREMENT & PAYMENT

2.1 MEASUREMENT: Trench Excavation Protection shall be measured by the lump sum for the trenching and excavations shown or implied in the plans.

2.2 PAYMENT: Payment for Trench Excavation Protection, measured as prescribed above, shall be made at the unit price bid for "Trench Excavation Protection".

A. Payment shall include all components for design and construction of the Trench Protection System which can include, but not be limited to sloping, sheeting, trench boxes or trench shields, sheet

piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage. Payment shall also include the additional excavation and backfill required, any jacking, jack removal, and removal of the trench supports after completion.

B. Payment of all work prescribed under this item shall be full compensation for all additional excavation and backfill; for furnishing, placing and removing all shoring, sheeting, or bracing; for dewatering or diversion of water; for all jacking and jack removal; and for all other labor, materials, tools, equipment and incidentals necessary to complete the work.

END OF SECTION 315100

SECTION 321216 - HOT MIX ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Hot mix asphalt concrete (HMAC) pavement shall consist of a binder course, a leveling up course, a surface course or a combination of the courses as shown on the plans, or as directed by the ENGINEER.

B. HMAC pavement shall be composed of a compacted mixture of mineral aggregate and asphaltic material, constructed on previously completed and approved subgrade, subbase course, base course, or existing pavement.

C. HMAC pavement shall be in accordance with the specifications herein and in conformity with the lines, grades, quantities and typical sections in the contract and/or as directed by the ENGINEER.

1.2 QUALITY CONTROL:

HMAC pavement and its constituent part shall conform to the ASTM, AASHTO and/or Texas SDHPT test methods noted below.

1.3 SUBMITTALS

Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.
Certificates: Manufacturer's certification that products meet specification requirements.
Contractor shall submit Design Mixtures, including additive modifiers, for review and approval at least 30 days before any asphaltic pavement is placed.

PART 2 - PRODUCTS

2.1 ASPHALTIC MATERIALS

A. Asphalt cement binders shall be uncracked petroleum asphalt and shall be carefully refined, by steam, vacuum, or solvent, from asphaltic or semi-asphaltic base crude petroleum at a temperature not to exceed 700 degrees F. Asphalt cements shall be free from thermal decomposition products and shall not be blended with any materials which have been subjected to cracking or produced from a crude petroleum source other than that of the original material. The asphalt cement shall not contain residues from non-asphaltic sources. Asphalt cement shall be homogeneous, free from water, and shall not foam when heated to 347 degrees F.

B. Paving asphalt shall be classified by penetration or viscosity and shall conform to the requirements set forth in one of the following tables as designated by the ENGINEER. The CONTRACTOR may supply asphalt meeting the requirements of one of the following tables provided that he obtains prior approval of the ENGINEER and with the provision that once approval has been obtained, that the CONTRACTOR will remain with that grade throughout the project.

TABLE 32 12 16 - 1

Specification Designation	AASHTO Test Method	ASTM Test Method	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Flash Point (Open cup) Min.	T48	D92	450	450	450	425	350	
Penetration of Orig. Sample at 77	T49	D5	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Thin-Film Oven Loss, Hours at 325 F, % Max	T179	D1754	0.75	0.75	0.75	0.75	1.00	1.00
Test of Residue from Thin-Film Oven Test: % of Orig. Pen., Min.	T49	D5	52	50	50	50	50	50
Ductility at 77 F, cm. after Loss at 325 F, Min.	T51	D113	50	50	100	100	100	100
Solubility in CC1 4 Min.	T44*	None	99.5	99.5	99.5	99.5	99.5	99.5
Reaction to Spot Test	T102**	None	-0-	-0-	-0-	-0-	-0-	-0-

* Procedure No. 1 with CC1 4 substituted for CS2.

** Using 85% Standard Naphtha Solvent and 15% xylene.

TABLE 32 12 16 -2

TYPE-GRADE	OA-30 Min.	OA-30 Max	OA-175*8 Min.	OA-175*8 Max	OA-400 Min.	OA-400 Max
Penetration at 32 F, 200g., 60 sec	15	--	--	--	--	--
Penetration at 77 F, 100g., 5 sec	25	35	150	200	--	--
Penetration at 115 F, 50g., 5 sec	--	65	--	--	--	--
Ductility at 77 F, 5 Original OA	2	--	70	--	--	--
Flash Point C.O.C.,F	450	--	425	--	425	--
Softening Point, R.&B.,F	185	--	95	130	--	--
Thin Film Oven Test, 1/8 in.Film 50 g., 5hrs.,325 F, % Loss by wt	--	0.4	--	1.4	--	2.0
Penetration of Residue, at 77 F, 100g., 5 sec. % of Original Pen	--	--	40	--	--	--
Ductility of Residue at 77 F, 5 cm/min., cms	--	--	--	100	--	--
Solubility in Trichloroethylene, %	99.0	--	99.0	--	99.0	--
Spot Test on Original OA	Neg.		Neg.		Neg.	
Float Test at 122 F, sec	--	--	--	--	120	150
Test on 85 to 115 Pen. Residue*						
Residue by Wt., %	--	--	--	--	75	--
Ductility, 77 F, 5 cm/min:						
Original Res., cms	--	--	--	--	100	--
Subjected to Thin Film Test, cms	--	--	--	--	100	--

*Determined by Vacuum Distillation (by evaporation if unable to reduce by vacuum).

**For use with Latex Additive only.

TABLE 32 12 16-3

PROPERTIES	AC-1.5 MIN	AC-1.5 MAX	AC-3 MIN	AC-3 MAX	AC-5 MIN	AC-5 MAX	AC-10 MIN	AC-10 MAX	AC-20 MIN	AC-20 MAX	AC-20 MIN	AC-20 MAX
Viscosity, 140F Stokes	150	50	300	100	500	100	1000	200	2000	400	4000	800
Viscosity, 275 F stokes.	0.7	--	1.1	--	1.4	--	1.9	--	2.5	--	3.5	--
Penetration, 77 F 100 g, 5 sec. .	250	--	210	--	35	--	85	--	55	--	35	--
Flash Point, C.O.C.,F. . . .	425	--	425	--	425	--	450	--	450	--	450	--
Solubility in trichloroethylene, percent. . . .	99.0	--	99.0	--	99.0	--	99.0	--	99.0	--	99.0	--
Test on residues from thin film oven test: Viscosity, 140F stokes.	--	450	--	900	1500	--	3000	--	6000	--	--	12000
Ductility, 77 F, 5 cms per min, cms	100	--	100	--	100	--	70	--	50	--	30	--
Spot test. . . .	Negative for all grades											

C. A minimum of two percent, by weight, latex additive (solids basis) shall be added to the OA-175 Asphalt or to AC-5 Asphalt when specified in the contract. The latex additive shall be governed by the following specifications:

The latex is to be an anionic emulsion of butadiene-styrene low-temperature copolymer in water, stabilized with fatty-acid
soap so as to have good storage stability, and possessing the following properties:

Monomer ratio, B/S	70/30
Minimum solids content	67%
Solids content per gal.@ 67%	5.3 lbs.
Coagulum on 80-mesh screen	0.01% max.
Type Anti-oxidant staining	
Mooney viscosity of Polymer(M/L 4@212F)	100 min.
pH of Latex	9.4 - 10.5
Surface tension	28-42 dynes/cm2

The finished latex-asphalt blend shall met the following requirements:

Viscosity at 140 F, stokes	1500 max.
Ductility at 39.2 F. 1 cm. per., cm	100 min.

D. Asphalt content shall be within the limits noted below:

HMAC Type	Percent of Mixture by Weight	Percent of Mixture by Volume
"A"	3.5 - 7.0	8.0 - 16.0
"B"	3.5 - 7.0	8.0 - 16.0
"C"	3.5 - 7.0	8.0 - 16.0
"D"	4.0 - 8.0	9.0 - 19.0
"F"	3.5 - 6.5	8.0 - 16.0

E. At the time of delivery of each shipment of asphalt, the vendor supplying the material shall deliver to the purchaser certified copies of the test report which shall indicate the name of the vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, and results of the above-specified tests. The test report shall be certified and signed by an authorized representative of the vendor that the product delivered conforms to the specifications for the type and grade indicated.

F. Until the certified test reports and samples of the material have been checked by the ENGINEER to determine their conformity with the prescribed requirements, the material to which such report relates an any work in which it may have been incorporated as an integral component will be only tentatively accepted by the City. Final acceptance will be dependent upon the determination of the ENGINEER that the material involved fulfills the requirements prescribed therefor. The certified test reports and the testing required in connection with the reports will be at the expense to the City.

G. Unless otherwise specified in these specifications or in the Supplementary Specifications, the various grades of paving asphalt shall be applied at a temperature range of from 210 F, the exact temperature to be determined by the ENGINEER.

H. Paving asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the paving asphalt during heating. The CONTRACTOR shall furnish and keep on the site, at all times, an accurate thermometer suitable for determining the temperature of the paving asphalt.

I. HMAC asphalt shall be the grade having the highest penetration, within specified limits, to produce a mix having a maximum stability of the compacted mixtures.

J. Only one (1) grade of asphalt shall be required unless otherwise shown on the plans or as required by the ENGINEER.

2.2 AGGREGATES

A. HMAC aggregate will be tested in accordance with the following test:

AASHTO T-30 Mechanic Testing
AASHTO T-27 Passing No. 200 Sieve
AASHTO T-89 Liquid Limit
AASHTO T-96 Los Angeles Abrasion
AASHTO T-104 Soundness (Magnesium Sulfate)
ASTM C – 131 Resistance to Degradation
ASTM C – 136 Sieve Analysis
ASTM C – 2419 Sand Equivalence Value
SDHPT Tex - 106-EMethod of Calculating Plasticity Index of Solids
SDHPT Tex-217 – F(I & II) Determination of Deleterious Materials and Decantation Test
SDHPT Tex-203 – F Quality Tests for Mineral Aggregates

B. Aggregates shall have an abrasion of not more than 40 for all course except the non-skid surface course, which shall have an abrasion of not more than 35.

C. When property proportioned, HMAC aggregate shall produce a gradation which will conform to the limitations for classification for HMAC type shown below, or as directed by the ENGINEER.

D. Course aggregate to be crushed limestone rock or crushed gravel with hydrated lime or limestone filler. (Crushed gravel shall be per Highway Department Specifications.)

E. Binder aggregate to be composed of 15% crushed limestone screening or as directed by the engineer.

1. Type "A" - Course Graded Base Course

	Percent Aggregate by Weight or Volume
Passing 2" sieve	100
Passing 1-3/4" sieve	95 to 100
Passing 1-3/4" sieve, retained on 7/8"sieve	16 to 42
Passing 7/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve	10 to 26
Passing No.40 sieve, retained on No.10 sieve	5 to 21
Total retained on No. 10 sieve	68 to 84
Passing No.10 sieve, retained on No.40 sieve	5 to 21
Passing No.40 sieve, retained on No.80 sieve	3 to 16
Passing No.80 sieve, retained on No.200 sieve	2 to 16
Passing No.200 sieve	1 to 8

2. Type "B" - Fine Graded or Leveling-Up Course

	Percent Aggregate by Weight or Volume
Passing 1" sieve	100
Passing 7/8" sieve	95 to 100
Passing 7/8" sieve	21 to 53
Passing 3/8" sieve, retained on 3/8"sieve	11 to 42
Passing No.4 sieve, retained on No.10 sieve	5 to 26
Total retained on No.10 sieve	58 to 74
Passing No.10 sieve, retained on No.40 sieve	6 to 32
Passing No.40 sieve, retained on No.80 sieve	4 to 21
Passing No.80 sieve, retained on No.200sieve	3 to 21
Passing No.200 sieve.	1 to 8

3. Type "C" - Course Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 7/8" sieve	100
Passing 5/8" sieve	95 to 100
Passing 5/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No.4 sieve	11 to 37
Passing No.4 sieve, retained on No.10 sieve	11 to 32
Total retained on No.10 sieve	54 to 74
Passing No.10 sieve, retained on No.40 sieve	6 to 32
Passing No.40 sieve, retained on No.80 sieve	4 to 27
Passing No.80 sieve, retained on No.200sieve	3 to 27
Passing No.200 sieve	1 to 8

4. Type "D" - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 1/2" sieve	to 100
Passing 3/8" sieve	85 to 100
Passing 3/8" sieve, retained on No.4 sieve	21 to 53
Passing No.4 sieve, retained on No.10 sieve	11 to 32
Total retained on No.10 sieve	54 to 74
Passing No.10 sieve, retained on No.40sieve	6 to 32
Passing No.40 sieve, retained on No.80sieve	4 to 27
Passing No.80 sieve, retained on No.200sieve	3 to 27
Passing No.200 sieve	1 to 8

5. Type "F" - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 3/8" sieve	100
Passing No.4 sieve	95 to 100
Passing No.4 sieve, retained on No.10 sieve	58 to 73
Passing No.10 sieve, retained on No.40 sieve	6 to 26
Passing No.40 sieve, retained on No.80 sieve	3 to 13
Passing No.80 sieve, retained on No.200sieve	2 to 11
Passing No.200 sieve	1 to 8

2.3 PRIME COAT

A. Prime coat, when specified on the plans, or as directed by the ENGINEER, shall be in accordance with Section 321280 - Prime Coat, and as specified herein.

B. Prime coat shall be applied to surfaces of bases at least 12 hours prior to placing the HMAC unless otherwise directed by the ENGINEER.

C. Asphalt prime shall be applied uniformly at the rate of 0.10 to 0.30 gallon per square yard or as directed by the ENGINEER. It shall be applied only when permitted by the ENGINEER and when the air temperature is not less than 40 F.

D. In order to prevent lapping at the junction of two applications, the distributor shall be promptly shut off. A hand spray shall be used to touch up all spots unavoidably missed by the distributor.

E. Immediately prior to application of the asphalt prime, an inspection will be made by the ENGINEER to verify that the base course has been constructed as specified. Also, all loose and foreign material shall be removed by light sweeping. Material so removed shall not be mixed with cover aggregate.

F. The surface to be primed shall be in a smooth an well-compacted condition, true to grade and cross section, and free from ruts and inequalities.

G. The pressure distributor used for applying prime coat material shall be equipped with pneumatic tires and shall be so designed and operated as to distribute the prime material in a uniform spray without atomization, in the amount an between the limits of temperature specified. It shall be equipped with a speed tachometer registering feet per minute and so located as to be visible to the truck driver to enable him to maintain the constant speed required for application at the specified rate.

H. The pressure distributor shall be equipped with a tachometer registering the pump speed, pressure gauge, and a volume gauge. The rates of application shall not vary from the rates specified by the ENGINEER by more than 10%. Suitable means for accuracy indicating at all times the temperature of the prime material shall be provided. The thermometer well shall be so placed as not to be in contact with a heating tube.

I. The distributor shall be so designed that the normal width of application shall be not less than 6 feet, with provisions for the application of lesser width when necessary. If provided with heating attachments, the distributor shall be so equipped and operated that the prime material shall be circulated or agitated through the entire heating process.

J. The asphalt prime coat should preferably be entirely absorbed by the base course and, therefore, require no sand cover. If, however, it has not been completely absorbed prior to the start of placing the asphalt concrete mixture and in the meantime it is necessary to permit traffic thereon, just sufficient sand shall be spread over the surface to blot up the excess liquid asphalt and prevent picking it up under traffic. Also, sand shall be used in areas where traffic may pass over the prime coat. Prior to placing the asphalt concrete, loose or excess sand shall be swept from the base. If a sand cover is specified in the Supplementary Specifications or noted on the plans to cover asphalt prime, it shall be applied within 4 hours after the application of said prime coat, unless otherwise ordered by the ENGINEER.

K. Liquid asphalt shall be prevented from spraying upon adjacent pavements, structures, guard rails, guide posts, culvert markers, trees, and shrubbery that are not to be removed; adjacent property and improvements; and other facilities or that portion of the traveled way being used by traffic.

L. The CONTRACTOR shall protect the prime coat against all damage and markings, both from and other traffic. Barricades shall be placed where necessary to protect the prime coat. If, after prime coat has been applied satisfaction of the ENGINEER and has bee accepted by him, it is distributed by negligence on the part of the CONTRACTOR, it shall be restored at his expense to its condition at the time of acceptance. No material shall be placed until the prime coat is in a condition satisfactory to the ENGINEER.

2.4 TACK COAT

A. If the asphalt concrete pavement is being constructed directly upon an existing hard-surfaced pavement, a tack coat shall be evenly and uniformly applied to such existing pavement proceeding the

placing of the asphalt concrete. The surface shall be free of water, all-foreign material, or dust when the tack coat is applied. No greater area shall be treated in any one day than will be covered by the asphalt concrete during the same day. Traffic will not be permitted over tack coating.

B. Tack coat for HMAC shall consist of either rapid curing cut-back asphalt RC-2 diluted by addition of (not to exceed 15 percent by volume) an approved grade of gasoline and/or kerosene; emulsified asphalt, EA-11M diluted with 50 percent water, or a cut-back asphalt made by combining 50 to 70 percent of the asphaltic materials specified for the paving mixture with 30 to 50 percent gasoline and/or kerosene by volume.

C. Tack coat shall conform to the requirements as specified herein.

D. Application rate shall be 0.10 to 0.15 gallons per square yard as directed by the ENGINEER.

E. A similar tack coat shall be applied to the surface of any course if, in the opinion of the ENGINEER, the surface is such that a satisfactory bond cannot be obtained between it and the succeeding course.

F. When required, the contact surfaces of all cold pavement joints, curbs, gutters, manholes, and the like shall be painted with a tack coat immediately before the adjoining asphalt concrete is placed. Asphalt tack coat shall be applied in controlled amounts as shown on the plans or determined by the ENGINEER. Surfaces where a tack coat is required shall be cleaned to the satisfaction of the ENGINEER before the tack coat is applied.

2.5 MINERAL FILLER

A. Mineral filler, other than hydrated lime, shall consist of a thoroughly dry stone dust, portland cement or other mineral dust approved by the ENGINEER.

B. The mineral filler shall be free from foreign or other deleterious matter.

C. When tested by the method outlined in SDHPT Test Method Tex-200-F (Part 1 or 3), mineral filler shall meet the following gradations by weight:

Passing No. 30 Sieve	95-100%
Passing No. 80 Sieve	75%
Passing No. 200 Sieve	55%

2.6 ANTI-STRIPPING

A. Anti-Stripping compound, as required in the job mix formula, shall be furnished in the amounts calculated therein.

2.7 JOB MIX FORMULA

A. A job mix formula based on representative samples, including filler if required, shall be determined by the ENGINEER, or submitted by the CONTRACTOR for approval of the ENGINEER.

B. The resultant job mix formula shall be within the master range for the specified type of HMAC.

C. The job mix formula for each mixture shall established a single percentage of aggregate passing each required sieve size, and a single percentage of bituminous material to be added to the aggregate and shall provide for 3 to 5% air voids in the resultant design mix. During the mix design process the ENGINEER will consider other factors, in addition to air voids and Marshall stability, such as durability, water resistance and asphalt film thickness when developing the mix design.

D. After the job mix formula is established, mixtures for the project shall conform thereto within the following tolerances which may fall outside of the specified master range:

Percent by Weight or
Volume as Applicable

Passing 1-3/4" sieve, retained on 7/8" sieve	Plus or minus 5
Passing 7/8" sieve, retained on 3/8" sieve	Plus or minus 5
Passing 5/8" sieve, retained on 3/8" sieve	Plus or minus 5
Passing 3/8" sieve, retained on No.4 sieve	Plus or minus 5
Passing No.4 sieve, retained on No.10 sieve	Plus or minus 5
Total retained on No.10 sieve	Plus or minus 5
Passing No.10 sieve, retained on No.40 sieve	Plus or minus 3
Passing No.40 sieve, retained on No.80 sieve	Plus or minus 3
Passing No.80 sieve, retained on No.200 sieve	Plus or minus 3
Passing No.200 sieve	Plus or minus 3
Asphaltic Material wt or 1.2 by vol.	Plus or minus 0.05 by
Mixing Temperature	Plus or minus 20 F

E. Asphaltic mixture shall be tested in accordance with SDHPT Test Method Tex-200-4 (Part I or Part III) and shall have the following laboratory values:

Surface Course Base Course

Density–Minimum……..… 95%……..…..95%
Maximum……...…….....99%……..…..99%
Optimum……..…..…..97%……..……..97%

Stability (Hveenm)……
Minimum……30%…….30%
Maximum…...……45%…….……45%

Stability (Marshall - 75 Blow Briquette)……...…..…..…..…1500 lbs……1500lbs.

Voids……..……..3 - 7%…….…….…….…….…….4 - 7%

Voids Filled With Asphalt…..…...75 - 85%…….…….……..65 - 80%

Sand Equivalent…….…..40…….……40

2.8 EQUIPMENT

A. All equipment for the handling of all material, mixing, and placing of HMAC shall be in accordance with the provisions of Texas SDHPT Item 340.

2.9 STOCKPILING, STORAGE, PROPORTIONING AND MIXING

A. Stockpiling, storage proportioning and mixing operations shall be in accordance with the Provisions of Texas SDHPT Item 340.

PART 3 - EXECUTION

3.1 WEATHER AND TEMPERATURE LIMITATIONS:

A. Asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall not be placed when the air temperature is 50 F and falling, but may be placed when the air temperature is 40 F and rising.

B. Asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is 60 F and falling, but may be placed when the air temperature is 50 F and rising.

C. Mat thickness of 1> inches or less shall not be placed when the temperature on which the mat is to be laid is below 50 F.

D. No tack coat or asphaltic mixture shall be placed when the humidity, general weather conditions and temperature and moisture condition of the base, in the opinion of the ENGINEER, are unsuitable.

E. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture is 50 F or more below the temperature established by the ENGINEER, all or any part of the load may be rejected and payment will not be made for the rejected material.

3.2 EQUIPMENT

A. Hauling Equipment:

1. Trucks used for hauling asphaltic mixtures shall have tight, clean, smooth metal beds which have been thinly coated with a minimal amount of paraffin oil, lime slurry, tine solution or other approved material to prevent mixture adhesion to the bed.

2. The dispatching of hauling equipment shall be arranged so that all material delivered may be placed and all rolling completed during daylight hours, unless otherwise directed by the ENGINEER.

3. All trucks shall be equipped with a cover of canvas, or other suitable material to protect the mixture from weather or on hauls where the temperature of the mixture will fall below specified level. Use of covers will be as directed by the ENGINEER.

B. Rollers:

1. Pneumatic Tile Roller. This roller shall consist of not less than seven pneumatic tire wheels, running on axles in such manner that the rear group of tires shall cover the entire gap between adjacent tires of the forward group; mounted in a rigid frame; and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle. The tire shall afford surface contact pressures up to 90 pounds per square inch or more. The roller shall be so constructed as to operate in both a forward and a reverse direction with suitable provisions for moistening the surface of the tires while suitable provisions for moistening the surface of the tires while operating; and shall be approved by the ENGINEER.

2. Two Axle Tandem Roller. This roller shall be acceptable power-driver, steel-wheel, tandem roller weighing not less than eight tons. It must operate in forward and reverse directions; contain

provision for moistening the surface of the wheels while in motion; and shall be approved by the ENGINEER.

3. Three Wheel Roller. This roller shall be an acceptable power- driven, all steel three wheel roller weighing not less than 10 tons. It must operate in forward and reverse directions; contain provisions for moistening the surface of the wheel while in motion; and shall be approved by the ENGINEER.

4. Vibratory Steel Wheel Roller. If approved for use by the OWNER, this roller shall have a minimum weight of six tons. The compactor shall be equipped with amplitude and frequency controls and shall be specifically designed to compact the material on which it is used. It shall be operated in accordance with the manufacturer's recommendations.

C. Straight Edges:

1. The CONTRACTOR shall provide an acceptable 16-foot straight- edges for surface testing. Satisfactory templates shall be provided as required by the ENGINEER.

D. Spreading and Finishing Machine:

1. Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or a strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans.

2. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. Design will be such that no part of the truck weight will be supported by the paver.

3. The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture. When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The screed shall be adjustable for both height and crown and shall be equipped with a controlled heating device.

4. The bituminous paver shall be equipped with an automatic leveling device controlled from an external guide. The initial pass for each course shall be made using a paver equipped with a 40-foot minimum external reference, except that this requirements will not apply when asphalt concrete is placed adjacent to portland cement concrete pavement. Subsequent passes may utilize the matching device of one foot minimum length riding on the adjacent lay.

3.3 CONSTRUCTION METHODS

A. Spreading and Finishing:

1. The asphalt concrete mixture shall be laid on the approved surface, spread and struck off to the grade and elevation established. It shall be spread and compacted in layers as shown on the plans or as directed by the ENGINEER. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

2. The ENGINEER will determine a minimum placement temperature within a range from 220 F to 300 F which will produce the required density. The established placement temperature, which is measured immediately behind the laydown machine, shall not vary more than 20 F.

3. A conventional paver or suitable equipment approved by the ENGINEER may be used t place asphalt concrete material on shoulders depressed from the traveled lanes in order to established a uniform typical section. Approval of the equipment used will be based upon the results obtained.

4. The asphalt concrete may be dumped from the hauling vehicles directly into the paving machine or it may be dumped upon the surface being paved and subsequently loaded into the paving surface being paved and subsequently loaded into the paving machine; however, no asphaltic concrete shall be dumped from the hauling vehicles at a distance greater than 250 feet in front of the paving machine. When asphaltic concrete is dumped first upon the surface being paved, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphaltic concrete dumped shall be picked up and loaded into the paving machine.

5. To achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. Sufficient hauling equipment shall be available to insure continuous operation.

6. The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other indirectly either through controlling the transverse slope or alternately when directed, by controlling the elevation of each end independently, including any screed attachment used for widening, etc. Failure of the control system to function properly shall be cause for the suspension of the asphaltic concrete operations.

7. When dumping directly into the paving machine from trucks, care shall be taken to avoid jarring the machine or moving it out of alignment.

8. All courses of asphaltic concrete shall be placed and finished by means of self-propelled paving machines except under certain conditions or at certain locations where the ENGINEER deems the use of self-propelled paving machines impracticable.

9. Self-propelled paving machines shall spread the asphaltic concrete without segregation or tearing within the specified tolerances, true to the line, grade, and crown indicated on the plans. Pavers shall be equipped with hoppers and augers which will place the asphaltic concrete evenly in front of adjustable screeds without segregation. Screeds shall include any strike-off device operated by tamping or vibrating action which is effective without tearing, shoving or gouging the asphaltic concrete and which produces a finished surface of an even and uniform texture for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.

10. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, fluted and compacted with hand tools. For such areas the mixture shall be dumped, spread and screed to give the required compacted thickness.

B. Compaction:

1. Rolling with the 3-wheel and tandem roller shall start longitudually at the sides and proceed toward the center of the surface course, overlapping on successive trips by at least half the width of the rear wheels.

2. Alternate trips of the roller shall be slightly different in length.

3. Rolling with a pneumatic tired roller shall be as directed by the ENGINEER.

4. Rolling shall continue with no further compression can be obtained and all roller marks are eliminated.

5. The motion of the roller shall be slow enough at all times to avoid displacement of asphaltic materials. If displacement occurs, it shall be corrected immediately by use of rakes and fresh asphaltic mixtures, where required.

6. The roller shall not be allowed to stand on the surface course when it has not been fully compacted and allowed to cool.

7. To prevent adhesion of the surface course to the roller, the wheels shall be kept thoroughly moistened with water; however, excess water shall not be allowed.

8. All precautions shall be taken to prevent dripping of gasoline, oil, grease, or other foreign substances on the surface or base courses during rolling operations or while rollers are standing.

9. With the approval of the ENGINEER, a vibratory steel wheeled roller may be substituted for the 3-wheel roller and tandem roller.

10. Along forms, curbs, headers, walls and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

11. Any mixture that becomes loose, broken, mixed with dirt, segregated, or is in any way defective shall be removed and replaced with fresh hot bituminous mixture, which shall be compacted to conform with the surrounding area. Any area showing excess or deficiency of bituminous material shall be corrected immediately as directed by the ENGINEER.

C. In-Place Density:

1. In-place density shall be required for all mixtures except thin irregular depth leveling courses.

2. Each course, after final compaction, shall have a density of not less than 95 percent of the density developed in the laboratory test method outlined in Texas SDHPT Bulletin C-14.

3. Density shall be determined with a portable nuclear test device in conformity with ASTM D-2950.76.

4. Calibration of the portable nuclear device will be established by the ENGINEER from cut pavement samples tested in accordance with AASHTO T-166 (weight, volume method). The density readings of the cut pavement samples determined in accordance with AASHTO T-166 (weight, volume method), and the density readings of the pavement samples determined by the portable nuclear test device in conformity with ASTM D 2950 will be correlated by the ENGINEER.

5. Other methods of determining in-place density may be used as deemed necessary by the ENGINEER.

6. It is intended that acceptance density testing will be done while the bituminous mixture is hot enough to permit further compaction if necessary. If the density of an acceptance section does not meet the specified requirements, the CONTRACTOR shall continue the compaction effort until the optimum density is obtained, but rolling for any compactive effort will not be allowed when the temperature of the mix is below 175 F unless authorized in writing by the ENGINEER. Re-rolling the paved surface after it has initially cooled will not be allowed.

7. If in-place density tests of the mixture produce a value lower than specified and in the opinion of the ENGINEER is not due to a change in the quality of the material, production may proceed with subsequent changes in the mix and/or construction procedures until in-place density equals or exceeds the specified density.

8. In-place density tests will be provided by the ENGINEER unless otherwise specified.

D. Joints:

1. Placing of the asphalt concrete shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the ENGINEER.

2. When plant mix bituminous pavement is placed over plant mix bituminous treated base or when plant mixed seal coat is placed over plant mix bituminous pavement, longitudinal joints shall be staggered at least 6 inches with relation to the longitudinal joints of the underlying course.

3. Transverse joints shall have a two foot or 12:1 minimum taper. Longitudinal joints shall have a one foot or 6:1 minimum taper. All transverse tapers shall be cut and squared off prior to commencing new work. Tapered longitudinal joints from previous operations shall be cleaned and tack coated if directed by the ENGINEER. All joints shall be completely bonded. The surface of each course at all joints shall be smooth and shall not show any deviations in excess of 3/16 of an inch when tested with a 10-foot straightedge in any direction.

4. When paving under traffic the CONTRACTOR shall plan his daily surfacing operations on a schedule which will result in not more than one (1) day's operation of exposed longitudinal joints.

5. The longitudinal joints shall not have a height greater than two (2) inches and shall not be left exposed longer than 24 hours.

E. Surface Tolerance:

1. Upon completion, the pavement shall be true to grade and cross section. Except at intersections or any changes of grade, when a 16 foot straight edge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straight edge more than 1/16-inch per foot. Areas that are not within this tolerance shall be brought to grade immediately following the initial rolling. After the completion of final rolling, the smoothness of the course shall be checked, and the irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective work and replacing with new material as directed by the ENGINEER at the expense of the CONTRACTOR.

F. Manholes and Valve Covers:

1. Manhole frames and valve covers shall be adjusted prior to placing the surface course.

G. Compacted Thickness of HMAC Surface and Base Courses:

1. Surface Courses. The compacted thickness or depth of the asphaltic concrete surface course shall be as shown on the plans. Where the plans require a depth or thickness of the surface course greater than two inches compacted depth, same shall be placed in multiple courses of equal depth, each of which shall not exceed two inches compacted depth. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple courses, it shall be applied at the rate as directed.

2. Base Courses. The compacted thickness or depth of each base course shall be as shown on the plans. Where the plans require a depth or thickness of the course greater than 4 inches, same shall be accomplished by constructing multiplelifts of approximately equal depth, each of which shall not exceed these maximum compacted depths. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple lifts, it shall be applied as hereinbefore specified and at the rate as directed.

Pavement Thickness Tests:

1. Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the ENGINEER or his authorized representative unless otherwise specified in the special provisions or in the plans. The number and location of tests shall be at the discretion of the OWNER. The cost for the initial pavement thickness test shall be at the expense of the OWNER. In the event a deficiency in the thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR'S expense. The cost for the additional coring test shall be at the same rate charged by commercial laboratories.

I. Price Adjustment for Roadway Density

1. The payment of the unit price will be adjusted for roadway density as outlined in the following table. The adjustment will be applied on a lot by lot basis for each lift. The adjustment will be based on the average of five density tests. The price adjustment will be applied to the entire asphalt concrete mix which includes the HMAC aggregate, the asphalt cement and anti-stripping compound, if used.

Average Density % of Lab Density	Percent of Contract Price to Be Paid
Above 95%	100%
94.0 to 94.99	96%
93.0 to 93.99	91%
92.0 to 92.99	85%
Less than 92.00	*

*This lot shall be removed and replaced to meet specification requirements as ordered by the ENGINEER. In lieu thereof, the CONTRACTOR and the ENGINEER may agree in writing that for practical purposes, the lot shall not be removed and will be paid for at 50% of the contract price.

END OF SECTION 321216

SECTION 321260 ASPHALTS, OILS AND EMULSIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide asphalt cements, cutback and emulsified asphalts, performance-graded asphalt binders, and other miscellaneous asphalt materials as specified on the plans.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Provide asphalt materials that meet the stated requirements when tested in accordance with the referenced Department, AASHTO, and ASTM test methods. Refer to the Material Inspection Guide (maintained by the Construction Division), Section 11. "Asphalt Inspection, Quality Control and Quality Assurance," for sampling and testing requirements. Acronyms used in this Item are defined in Table 1.

Table 1
Acronyms

Acronym	Definition
Test Procedure Designations	
Tex	Department
T or R	AASHTO
D	ASTM
Polymer Modifier Designations	
P	polymer-modified
SBR or L	styrene-butadiene rubber (latex)
SBS	styrene-butadiene-styrene block co-polymer
TR	tire rubber (from ambient temperature grinding of truck and passenger tires)
AC	asphalt cement
AE	asphalt emulsion
AE-P	asphalt emulsion prime
A-R	asphalt-rubber
C	cationic
EAP&T	emulsified asphalt prime and tack
H-suffix	harder residue (lower penetration)
HF	high float
MC	medium-curing

Table 1 (continued)
Acronyms

Acronym	Definition
MS	medium-setting
PCE	prime, cure, and erosion control
PG	performance grade
RC	rapid-curing
RS	rapid-setting
S-suffix	stockpile usage
SCM	special cutback material
SS	slow-setting

A. Asphalt Cement. Asphalt cement must be homogeneous, water-free, and nonfoaming when heated to 347°F, and must meet Table 2 requirements.

B. Table 2
C. Asphalt Cement

Property	Test Procedure	Viscosity Grade									
		AC-0.6		AC-1.5		AC-3		AC-5		AC-10	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity	T 202										
140°F, poise		40	80	100	200	250	350	400	600	800	1,200
275°F, poise		0.4	–	0.7	–	1.1	–	1.4	–	1.9	–
Penetration, 77°F, 100g, 5 sec.	T 49	350	–	250	–	210	–	135	–	85	–
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–	450	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.		Neg.	
Tests on residue from Thin-Film Oven Test:	T 179										
Viscosity, 140°F, poise	T 202	–	180	–	450	–	900	–	1,500	–	3,000
Ductility[1], 77°F 5 cm/min., cm	T 51	100	–	100	–	100	–	100	–	100	–

1. If AC-0.6 or AC-1.5 ductility at 77°F is less than 100 cm, material is acceptable if ductility at 60°F is more than 100 cm.

A. Polymer-Modified Asphalt Cement. Polymer-modified asphalt cement must be smooth and homogeneous, and comply with the requirements of Table 3. If requested, supply samples of the base asphalt cement and polymer additives.

Table 3
Polymer-Modified Asphalt Cement

Property	Test Procedure	Polymer-Modified Viscosity Grade							
		AC-5 w/2% SBR		AC-10 w/2% SBR		AC-15P		AC-20-5TR	
		Min	Max	Min	Max	Min	Max	Min	Max
Polymer		SBR		SBR		SBS		TR	
Polymer content, % (solids basis)	Tex-533-C	2.0	–	2.0	–	3.0	–	5.0	–
Dynamic shear, G*/sin δ, 64°C, 10 rad/s, kPa	T 315	–	–	–	–	–	–	1.0	–
Viscosity									
140°F, poise	T 202	700	–	1,300	–	1,500	–	2,000	–
275°F, poise	T 202	–	7.0	–	8.0	–	8.0	–	10.0
Penetration, 77°F, 100 g, 5 sec.	T 49	120	–	80	–	100	150	75	115
Ductility, 5cm/min., 39.2°F, cm	T 51	70	–	60	–	–	–	–	–
Elastic recovery, 50°F, %	Tex-539-C	–	–	–	–	55	–	55	–
Softening point, °F	T 53	–	–	–	–	–	–	120	–
Polymer separation, 48 hr.	Tex-540-C	None		None		None		None	
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–
Tests on residue from Thin-Film Oven Test: Retained penetration ratio, 77°F	T 179 T 49	–	–	–	–	0.60	1.00	0.60	1.00
Tests on residue from RTFOT aging and pressure aging: Creep stiffness	Tex-541-C and R 28 T 313								
S, -18°C, MPa		–	–	–	–	–	–	–	300
m-value, -18°C		–	–	–	–	–	–	0.300	–

C. Cutback Asphalt. Cutback asphalt must meet the requirements of Tables 4, 5, and 6 for the specified type and grade. If requested, supply samples of the base asphalt cement and polymer additives.

D. Table 4
E. Rapid-Curing Cutback Asphalt

Property	Test Procedure	Type–Grade					
		RC-250		RC-800		RC-3000	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	250	400	800	1,600	3,000	6,000
Water, %	T 55	–	0.2	–	0.2	–	0.2
Flash point, T.O.C., °F	T 79	80	–	80	–	80	–
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		40	75	35	70	20	55
to 500°F		65	90	55	85	45	75
to 600°F		85	–	80	–	70	–
Residue from distillation, volume %		70	–	75	–	82	–
Tests on distillation residue:							
Penetration, 100 g, 5 sec., 77°F	T 49	80	120	80	120	80	120
Ductility, 5 cm/min., 77°F, cm	T 51	100	–	100	–	100	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.	

Table 5

Medium-Curing Cutback Asphalt

Property	Test Procedure	Type–Grade							
		MC-30		MC-250		MC-800		MC-3000	
		Min	Max	Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	30	60	250	500	800	1,600	3,000	6,000
Water, %	T 55	–	0.2	–	0.2	–	0.2	–	0.2
Flash point, T.O.C., °F	T 79	100	–	150	–	150	–	150	–
Distillation test: Distillate, percentage by volume of total distillate to 680°F	T 78								
to 437°F		–	25	–	10	–	–	–	–
to 500°F		40	70	15	55	–	35	–	15
to 600°F		75	93	60	87	45	80	15	75
Residue from distillation, volume %		50	–	67	–	75	–	80	–
Tests on distillation residue:									
Penetration, 100 g, 5 sec., 77°F	T 49	120	250	120	250	120	250	120	250
Ductility, 5 cm/min., 77°F, cm[1]	T 51	100	–	100	–	100	–	100	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.	

Table 6
Special-Use Cutback Asphalt

Property	Test Procedure	Type–Grade					
		MC-2400L		SCM I		SCM II	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	2,400	4,800	500	1,000	1,000	2,000
Water, %	T 55	–	0.2	–	0.2	–	0.2
Flash point, T.O.C., °F	T 79	150	–	175	–	175	–
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		–	–	–	–	–	–
to 500°F		–	35	–	0.5	–	0.5
to 600°F		35	80	20	60	15	50
Residue from distillation, volume %		78	–	76	–	82	–
Tests on distillation residue:							
Polymer		SBR		–		–	
Polymer content, % (solids basis)	Tex-533-C	2.0	–	–	–	–	–
Penetration, 100 g, 5 sec., 77°F	T 49	150	300	180	–	180	–
Ductility, 5 cm/min., 39.2°F, cm	T 51	50	–	–	–	–	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–

D. Emulsified Asphalt. Emulsified asphalt must be homogeneous, not separate after thorough mixing, and meet the requirements for the specified type and grade in Tables 7, 8, 9, and 10.

Table 7
Emulsified Asphalt

Property	Test Procedure	Type–Grade									
		Rapid-Setting		Medium-Setting				Slow-Setting			
		HFRS-2		MS-2		AES-300		SS-1		SS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72										
77°F, sec.		–	–	–	–	75	400	20	100	20	100
122°F, sec.		150	400	100	300	–	–	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1
Miscibility	T 59	–		–		–		Pass		Pass	
Cement mixing, %	T 59	–	–	–	–	–	–	–	2.0	–	2.0
Coating ability and water resistance:	T 59										
dry aggregate/after spray		–		–		Good/Fair		–		–	
wet aggregate/after spray		–		–		Fair/Fair		–		–	
Demulsibility, 35 ml of 0.02 N $CaCl_2$, %	T 59	50	–	–	30	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1	–	1
Freezing test, 3 cycles[1]	T 59	–		Pass		–		Pass		Pass	
Distillation test:	T 59										
Residue by distillation, % by wt.		65	–	65	–	65	–	60	–	60	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	–	5	–	0.5	–	0.5
Tests on residue from distillation:											
Penetration, 77°F, 100 g, 5 sec.	T 49	100	140	120	160	300	–	120	160	70	100
Solubility in trichloroethylene, %	T 44	97.5	–	97.5		97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	100	–	100		–	–	100	–	80	–
Float test, 140°F, sec.	T 50	1,200	–	–		1,200	–	–	–	–	–

1. Applies only when the Engineer designates material for winter use.

Table 8
Cationic Emulsified Asphalt

Property	Test Procedure	Type–Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		CRS-2		CRS-2H		CMS-2		CMS-2S		CSS-1		CSS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72												
77°F, sec.		–	–	–	–	–	–	–	–	20	100	20	100
122°F, sec.		150	400	150	400	100	300	100	300	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1
Cement mixing, %	T 59	–	–	–	–	–	–	–	–	–	2.0	–	2.0
Coating ability and water resistance:	T 59												
dry aggregate/after spray		–		–		Good/Fair		Good/Fair		–		–	
wet aggregate/after spray		–		–		Fair/Fair		Fair/Fair		–		–	
Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	70	–	70	–	–	–	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1	–	1	–	1
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test:	T 59												
Residue by distillation, % by wt.		65	–	65	–	65	–	65	–	60	–	60	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	–	7	–	5	–	0.5	–	0.5
Tests on residue from distillation:													
Penetration, 77°F, 100 g, 5 sec.	T 49	120	160	70	110	120	200	300	–	120	160	70	110
Solubility in trichloroethylene, %	T 44	97.5	–	97.5	–	97.5	–	97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	100	–	80	–	100	–	–	–	100	–	80	–

Table 9
Polymer-Modified Emulsified Asphalt

Property	Test Procedure	Type–Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		RS-1P		HFRS-2P		AES-150P		AES-300P		AES-300S		SS-1P	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72												
77°F, sec.		–	–	–	–	75	400	75	400	75	400	30	100

Property	Test	Type–Grade											
122°F, sec.		50	200	150	400	–	–	–	–	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1
Miscibility	T 59	–		–		–		–		–		Pass	
Coating ability and water resistance:	T 59												
dry aggregate/after spray		–		–		Good/Fair		Good/Fair		Good/Fair		–	
wet aggregate/after spray		–		–		Fair/Fair		Fair/Fair		Fair/Fair		–	
Demulsibility, 35 ml of 0.02 N $CaCl_2$, %	T 59	60	–	50	–	–	–	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1	–	1	–	1
Breaking index, g	Tex-542-C	–	80	–	–	–	–	–	–	–	–	–	–
Distillation test:[1]	T 59												
Residue by distillation, % by wt.		65	–	65	–	65	–	65	–	65	–	60	–
Oil distillate, % by volume of emulsion		–	3	–	0.5	–	3	–	5	–	7	–	0.5
Tests on residue from distillation:													
Polymer content, wt. % (solids basis)	Tex-533-C	–	–	3.0	–	–	–	–	–	–	–	3.0	–
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	140	150	300	300	–	300	–	100	140
Solubility in trichloroethylene, %	T 44	97.0	–	97.0	–	97.0	–	97.0	–	97.0	–	97.0	–
Viscosity, 140°F, poise	T 202	–	–	1,500	–	–	–	–	–	–	–	1,300	–
Float test, 140°F, sec.	T 50	–	–	1,200	–	1,200	–	1,200	–	1,200	–	–	–
Ductility[2], 39.2°F, 5 cm/min., cm	T 51	–	–	50	–	–	–	–	–	–	–	50	–
Elastic recovery[2], 50°F, %	Tex-539-C	55	–	55	–	–	–	–	–	–	–	–	–
Tests on RTFO curing of distillation residue	Tex-541-C												
Elastic recovery, 50°F, %	Tex-539-C	–	–	–	–	50	–	50	–	30	–	–	–

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ±5 min. from the first application of heat.
2. HFRS-2P must meet one of either the ductility or elastic recovery requirements.

Table 10
Polymer-Modified Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade					
		Rapid-Setting				Slow-Setting	
		CRS-1P		CRS-2P		CSS-1P	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72						
77°F, sec.		–	–	–	–	20	100
122°F, sec.		50	150	150	400	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1

Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	60	–	70	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1
Breaking index, g	Tex-542-C	–	80	–	–	–	–
Particle charge	T 59	Positive		Positive		Positive	
Distillation test:[1]	T 59						
Residue by distillation, % by weight		65	–	65	–	62	–
Oil distillate, % by volume of emulsion		–	3	–	0.5	–	0.5
Tests on residue from distillation:							
Polymer content, wt. % (solids basis)	Tex-533-C	–	–	3.0	–	3.0	–
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	150	55	90
Viscosity, 140°F, poise	T 202	–	–	1,300	–	–	–
Solubility in trichloroethylene, %	T 44	97.0	–	97.0	–	97.0	–
Softening point, °F	T 53	–	–	–	–	135	–
Ductility, 77°F, 5 cm/min., cm	T 51	–	–	–	–	70	–
Ductility[2], 39.2°F, 5 cm/min., cm	T 51	–	–	50	–	–	–
Elastic recovery[2], 50°F, %	Tex-539-C	45	–	55	–	–	–

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±0°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ±5 min. from the first application of heat.
2. CRS-2P must meet one of either the ductility or elastic recovery requirements.

E. Specialty Emulsions. Specialty emulsions may be either asphalt-based or resin-based and must meet the requirements of Table 11

Table 11
Specialty Emulsions

Property	Test Procedure	Type–Grade					
		Medium-Setting				Slow-Setting	
		AE–P		EAP&T		PCE[1]	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72						
77°F, sec.		–	–	–	–	10	100
122°F, sec.		15	150	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1
Miscibility[2]	T 59	–		Pass		Pass	
Demulsibility, 35 ml of 0.10 N $CaCl_2$, %	T 59	–	70	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	–
Particle size[5], % by volume < 2.5 □m	Tex-238-F[3]	–	–	90	–	90	–
Asphalt emulsion distillation to 500°F followed by Cutback asphalt distillation of residue to 680°F:	T 59 & T 78						
Residue after both distillations, % by wt.		40	–	–	–	–	–
Total oil distillate from both distillations, % by volume of emulsion		25	40	–	–	–	–
Residue by distillation, % by wt.	T 59	–	–	60	–	–	–
Residue by evaporation[4], % by wt.	T 59	–	–	–	–	60	–
Tests on residue after all distillation(s):							
Viscosity, 140°F, poise	T 202	–	–	800	–	–	–
Kinematic viscosity[5], 140°F, cSt	T 201	–	–	–	–	100	350
Flash point C.O.C., °F	T 48	–	–	–	–	400	–
Solubility in trichloroethylene, %	T 44	97.5	–	–	–	–	–
Float test, 122°F, sec.	T 50	50	200	–	–	–	–

1. Supply with each shipment of PCE:
a) a copy of a lab report from an approved analytical lab, signed by a lab official, indicating the PCE formulation does not meet any characteristics of a Resource Conservation Recovery Act (RCRA) hazardous waste;
b) a certification from the producer that the formulation supplied does not differ from the one tested and that no listed RCRA hazardous wastes or PCBs have been mixed with the product; and
c) a Material Safety Data Sheet.
2. Exception to T 59: In dilution, use 350 ml of distilled or deionized water and a 1,000-ml beaker.
3. Use Tex-238-F, beginning at “Particle Size Analysis by Laser Diffraction,” with distilled or deionized water as a medium and no dispersant, or use another approved method.
4. Exception to T 59: Leave sample in the oven until foaming ceases, then cool and weigh.
5. PCE must meet either the kinematic viscosity requirement or the particle size requirement.

F. Recycling Agent. Recycling agent and emulsified recycling agent must meet the requirements in Table 12. Additionally, recycling agent and residue from emulsified recycling agent, when added in the specified proportions to the recycled asphalt, must meet the properties specified on the plans.

Table 12
Recycling Agent and Emulsified Recycling Agent

Property		Test Procedure	Recycling Agent		Emulsified Recycling Agent	
			Min	Max	Min	Max
Viscosity, Saybolt Furol, 77°F, sec.		T 72	–	–	15	100
Sieve test, %		T 59	–	–	–	0.1
Miscibility[1]		T 59	–		No coagulation	
Residue by evaporation[2], % by wt.		T 59	–	–	60	–
Tests on recycling agent or residue from evaporation:						
Flash point, C.O.C., °F		T 48	400	–	400	–
Kinematic viscosity,		T 201				
	140°F, cSt		75	200	75	200
	275°F, cSt		–	10.0	–	10.0

1. Exception to T 59: Use 0.02 N $CaCl_2$ solution in place of water.
2. Exception to T 59: Maintain sample at 300°F until foaming ceases, then cool and weigh.

G. Crumb Rubber Modifier. Crumb rubber modifier (CRM) consists of automobile and truck tires processed by ambient temperature grinding.

CRM must be:

- free from contaminants including fabric, metal, and mineral and other nonrubber substances;
- free-flowing; and
- nonfoaming when added to hot asphalt binder.

When tested in accordance with Tex-200-F, Part I, using a 50-g sample, the rubber gradation must meet the requirements of the grades in Table 13.

Table 13
CRM Gradations

Sieve Size (% Passing)	Grade A		Grade B		Grade C		Grade D	Grade E
	Min	Max	Min	Max	Min	Max		
#8	100	–	–	–	–	–	As shown on the plans	As approved
#10	95	100	100	–	–	–		
#16	–	–	70	100	100	–		
#30	–	–	25	60	90	100		
#40	–	–	–	–	45	100		
#50	0	10	–	–	–	–		
#200	–	–	0	5	–	–		

H. Crack Sealer. Polymer modified asphalt-emulsion crack sealer must meet the requirements of Table 14. Rubber-asphalt crack sealer must meet the requirements of Table 15.

Table 14
Polymer-Modified Asphalt Emulsion Crack Sealer

Property	Test Procedure	Min	Max
Rotational viscosity, 77°F, cP	D 2196, Method A	10,000	25,000
Sieve test, %	T 59	–	0.1
Storage stability, 1 day, %	T 59	–	1
Evaporation	Tex-543-C		
Residue by evaporation, % by wt.		65	–
Tests on residue from evaporation:			
Penetration, 77°F, 100 g, 5 sec.	T 49	35	75
Softening point, °F	T 53	140	–
Ductility, 39.2°F, 5 cm/min., cm	T 51	100	–

Table 15
Rubber-Asphalt Crack Sealer

Property	Test Procedure	Class A		Class B	
		Min	Max	Min	Max
CRM content, Grade A or B, % by wt.	Tex-544-C	22	26	–	–
CRM content, Grade B, % by wt.	Tex-544-C	–	–	13	17
Virgin rubber content[1], % by wt.		–	–	2	–
Flash point[2], COC, °F	T 48	400	–	400	–
Penetration[3], 77°F, 150 g, 5 sec.	T 49	30	50	30	50
Penetration[3], 32°F, 200 g, 60 sec.	T 49	12	–	12	–
Softening point, °F	T 53	–	–	170	–
Bond[4]	D5329	–		Pass	

1. Provide certification that the min. % virgin rubber was added.
2. Before passing the test flame over the cup, agitate the sealing compound with a 3/8- to 1/2-in. (9.5- to 12.7-mm) wide, square-end metal spatula in a manner so as to bring the material on the bottom of the cup to the surface, i.e., turn the material over. Start at one side of the thermometer, move around to the other, and then return to the starting point using 8 to 10 rapid circular strokes. Accomplish agitation in 3 to 4 sec. Pass the test flame over the cup immediately after stirring is completed.
3. Exception to T 49: Substitute the cone specified in ASTM D 217 for the penetration needle.
4. No crack in the crack sealing materials or break in the bond between the sealer and the mortar blocks over 1/4 in. deep for any specimen after completion of the test.

I. Asphalt-Rubber Binders. Asphalt-rubber (A-R) binders are mixtures of asphalt binder and CRM, which have been reacted at elevated temperatures. The A-R binders meet D 6114 and contain a minimum of 15% CRM by weight. Types I or II, containing CRM Grade C, are used for hot mixed aggregate mixtures. Types II or III, containing CRM Grade B, are used for surface treatment binder. Table 16 describes required binder properties.

Table 16
A-R Binders

Property	Test Procedure	Binder Type					
		Type I		Type II		Type III	
		Min	Max	Min	Max	Min	Max
Apparent viscosity, 347°F, cP	D 2196, Method A	1,500	5,000	1,500	5,000	1,500	5,000
Penetration, 77°F, 100 g, 5 sec.	T 49	25	75	25	75	50	100
Penetration, 39.2°F, 200 g, 60 sec.	T 49	10	–	15	–	25	–
Softening point, °F	T 53	135	–	130	–	125	–
Resilience, 77°F, %	D 5329	25	–	20	–	10	–
Flash point, C.O.C., °F	T 48	450	–	450	–	450	–
Tests on residue from Thin-Film Oven Test:	T 179						
Retained penetration ratio, 39.2°F, 200 g, 60 sec., % of original	T 49	75	–	75	–	75	–

J. Performance-Graded Binders. PG binders must be smooth and homogeneous, show no separation when tested in accordance with Tex-540-C, and meet Table 17 requirements.

Separation testing is not required if:

- a modifier is introduced separately at the mix plant either by injection in the asphalt line or mixer,
- the binder is blended on site in continuously agitated tanks, or
- binder acceptance is based on field samples taken from an in-line sampling port at the hot mix plant after the addition of modifiers.

Table 17
Performance-Graded Binders

Property and Test Method	Performance Grade																		
	PG 58			PG 64				PG 70				PG 76				PG 82		
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C[1]	< 58			< 64				< 70				< 76				< 82		
Min pavement design temperature, °C[1]	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
ORIGINAL BINDER																		
Flash point, T 48, Min, °C	230																	
Viscosity, T 316:[2, 3] Max, 3.0 Pa·s, test temperature, °C	135																	
Dynamic shear, T 315:[4] G*/sin(□□, Min, 1.00 kPa Test temperature @ 10 rad/sec., °C	58			64				70				76				82		
Elastic recovery, D 6084, 50°F, % Min	–	–	30	–	–	30	50	–	30	50	60	30	50	60	70	50	60	70
ROLLING THIN-FILM OVEN (Tex-541-C)																		
Mass loss, Tex-541-C, Max, %	1.0																	
Dynamic shear, T 315: G*/sin(□□, Min, 2.20 kPa Test temperature @ 10 rad/sec., °C	58			64				70				76				82		
PRESSURE AGING VESSEL (PAV) RESIDUE (R 28)																		
PAV aging temperature, °C	100																	
Dynamic shear, T 315: G*/sin(□□, Max, 5000 kPa Test temperature @ 10 rad/sec., °C	25	22	19	28	25	22	19	28	25	22	19	28	25	22	19	28	25	22

Table 17
Performance-Graded Binders

Property and Test Method	Performance Grade																		
	PG 58			PG 64				PG 70				PG 76				PG 82		
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C[1]	< 58			< 64				< 70				< 76				< 82		
Min pavement design temperature, °C[1]	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
Creep stiffness, T 313:[5, 6] *S*, max, 300 MPa, *m*-value, min, 0.300 Test temperature @ 60 sec., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18
Direct tension, T 314:[6] Failure strain, min, 1.0% Test temperature @ 1.0 mm/min., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18

1. Pavement temperatures are estimated from air temperatures using an algorithm contained in a Department-supplied computer program, may be provided by the Department, or by following the procedures outlined in AASHTO MP 2 and PP 28.

2. This requirement may be waived at the Department's discretion if the supplier warrants that the asphalt binder can be adequately pumped, mixed, and compacted at temperatures that meet all applicable safety, environmental, and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).

3. Viscosity at 135°C is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. Contractors should be aware that variation could significantly impact their mixing and compaction operations. Contractors are therefore responsible for addressing any constructability issues that may arise.

4. For quality control of unmodified asphalt binder production, measurement of the viscosity of the original asphalt binder may be substituted for dynamic shear measurements of G*/sin(□) at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).

5. Silicone beam molds, as described in AASHTO TP 1-93, are acceptable for use.

6. If creep stiffness is below 300 MPa, direct tension test is not required. If creep stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used instead of the creep stiffness requirement. The *m*-value requirement must be satisfied in both cases.

2.2 EQUIPMENT

A. Provide all equipment necessary to transport, store, sample, heat, apply, and incorporate asphalts, oils and emulsions.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. Typical Material Use. Table 18 shows typical materials used for specific applications, Theses are typical uses only. Circumstances may require use of other material.

Table 18
Typical Material Use

Material Application	Typically Used Materials
Hot-mixed, hot-laid asphalt mixtures	PG binders, A-R binders Types I and II
Surface treatment	AC-5, AC-10, AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20-5TR, HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, A-R binders Types II and III
Surface treatment (cool weather)	RS-1P, CRS-1P, RC-250, RC-800, RC-3000, MC-250, MC-800, MC-3000, MC-2400L
Precoating	AC-5, AC-10, PG 64-22, SS-1, SS-1H, CSS-1, CSS-1H
Tack coat	PG Binders, SS-1H, CSS-1H, EAP&T
Fog seal	SS-1, SS-1H, CSS-1, CSS-1H
Hot-mixed, cold-laid asphalt mixtures	AC-0.6, AC-1.5, AC-3, AES-300, AES-300P, CMS-2, CMS-2S
Patching mix	MC-800, SCM I, SCM II, AES-300S
Recycling	AC-0.6, AC-1.5, AC-3, AES-150P, AES-300P, recycling agent, emulsified recycling agent
Crack sealing	SS-1P, polymer mod AE crack sealant, rubber asphalt crack sealers (Class A, Class B)
Microsurfacing	CSS-1P
Prime	MC-30, AE-P, EAP&T, PCE
Curing membrane	SS-1, SS-1H, CSS-1, CSS-1H, PCE
Erosion control	SS-1, SS-1H, CSS-1, CSS-1H, PCE

B. Storage and Application Temperatures. Use storage and application temperatures in accordance with Table 19. Store and apply materials at the lowest temperature yielding satisfactory results. Follow the manufacturer’s instructions for any agitation requirements in storage. Manufacturer’s instructions regarding recommended application and storage temperatures supercede those of Table 19.

Table 19
Storage and Application Temperatures

Type–Grade	Application		Storage Maximum (°F)
	Recommended Range, °F	Maximum Allowable (°F)	
AC-0.6, AC-1.5, AC-3	200–300	350	350
AC-5, AC-10	275–350	350	350
AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20-5TR	300–375	375	360
RC-250	125–180	200	200
RC-800	170–230	260	260
RC-3000	215–275	285	285
MC-30, AE-P	70–150	175	175
MC-250	125–210	240	240
MC-800, SCM I, SCM II	175–260	275	275
MC-3000, MC-2400L	225–275	290	290
HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, CMS-2, CMS-2S, AES-300, AES-300S, AES-150P, AES-300P	120–160	180	180
SS-1, SS-1H, CSS-1, CSS-1H, PCE, EAP&T, SS-1P, RS-1P, CRS-1P, CSS-1P, recycling agent, emulsified recycling agent, polymer mod AE crack sealant	50–130	140	140
PG binders	275–350	350	350
Rubber asphalt crack sealers (Class A, Class B)	350–375	400	–
A-R binders Types I, II, and III	325–425	425	425

END OF SECTION 312100

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SECTION 321270 - FLEXIBLE BASE

PART I - GENERAL

1.1 GENERAL DESCRIPTION OF WORK

A. This work shall consist of furnishing and placing a foundation course for surface courses or for other base courses.

B. Flexible base shall be composed of either caliche (argillaceous limestone, calcareous or calcareous clay particles, with or without stone, conglomerate, gravel, sand or other granular materials), crushed stone, gravel, iron ore topsoil, shell, or crushed slag.

C. Flexible base shall be constructed as specified herein in one or more courses in conformance with details, lines and grades shown on the plans, and as established by the ENGINEER.

PART 2 -PRODUCTS

2.1 MATERIALS

A. Materials for flexible base shall be crushed or uncrushed as necessary to comply with the requirements hereinafter specified.

B. Materials shall consist of durable course aggregate particles mixed with approved binding materials.

2.2 LIME STABILIZATION

A. Where shown on the plans, or directed by the ENGINEER, material for flexible base shall be lime stabilized.

2.3 TYPES

A. Type A - Crushed or broken aggregate (excluding gravel aggregate).

B. Type B - Gravel Aggregate

C. Type C - Iron Ore Topsoil

D. Type D - Shell Aggregate with Sand Admixture

E. Type E - Shell Aggregate with Sand and Caliche Admixture

F. Type F – Caliche

G. Type G - Crushed Slag

H. Unless otherwise noted on the plans, the CONTRACTOR may use any one type of these types provided the material used meet the requirements set forth in the specification test limits herein.

2.4 GRADES

A. Unless otherwise shown on the plans or directed by the ENGINEER, the final course of base material shall consist of Grades 1,2,3, or 4, as specified in Table 32 12 70-1.

B. Base courses or subbase materials, unless otherwise noted on the plans or directed by the ENGINEER, may consist of Grades 1, 2, 3, or 4, as specified in Table 32 12 70-1.

C. All grades shall, when tested in accordance with standard laboratory test procedures, meet the physical requirements set forth in Table 32 12 70-1.

D. Testing of flexible base materials shall be in accordance with the following test procedures:

TEST	TESTING PROCEDURE
Preparation for soil constants and sieve analysis	TEX-101-E
Liquid Limit	TEX-104-E
Plastic Limit	TEX-105-E
Plasticity Limit	TEX-106-E
Sieve Analysis	TEX-110-E
Wet Ball Mill	TEX-116-E
Triaxial Test	TEX-117-E (Part I or II)

E. Unless otherwise specified on the plans, samples for testing the material for Soil constants, Gradation and Wet Ball Mill shall be taken prior to the compaction operations.

F. Unless otherwise specified on the plans, samples for triaxial tests shall be taken from the stockpile or from production, as directed by the ENGINEER, where stockpiling is required and from production where stockpiling is not required.

TABLE 32 12 70-1
PHYSICAL REQUIREMENTS FOR FLEXIBLE BASE MATERIALS

	GRADES			
TYPES	Grade 1 (Triaxial class 1,	Grade 2 (Triaxial class 1 to	Grade 3 (Unspecified Triaxial	Grade 4

Min. compress. Strength:	2.3, Min. compress. Strength:	Class)
45 psi at 0 psi lateral pressure	35 psi at 0 psi lateral pressure	
175 psi at 15 psi lateral pressure	175 psi at 15 psi lateral pressure	

TYPE A Crushed or Broken Aggregate (excluding gravel aggregate)	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %
	1-3/4”	10-35	1-3/4”	0-10	1-3/4”	0-10
	7/8”	30-50	-	-	-	-
	No. 4	45-65	No. 4	45-75	-	-
	No. 40	70-85	No. 40	60-85	No. 40	60-85
	Max LL	35	Max LL	40	Max LL	45
	Max PI	10	Max PI	12	Max PI	15
	Wet Ball Mill Max Amount in Passing No. 40	40	Wet Ball Mill Max Amount Max. Increase in Passing No. 40	50	Wet Ball Mill Max Amount Max. Increase in Passing No. 40	55
		20		20		20

TYPE B Gravel Aggregate	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %
	1-3/4”	0-10	1-3/4”	0-5
	No. 4	30-75	No. 4	30-75
	No. 40	70-85	No. 40	65-85
	Max LL	35	Max LL	35
	Max PI	12	Max PI	12

TYPE C Iron Ore Topsoil	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %
	-	-	2-3/4”	0
	2-1/2”	0	-	-
	No. 40	50-85	No. 40	45-85
	Max LL	35	Max LL	35
	Max PI	12	Max PI	12

TYPE D Sand-Shell	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %
	1-3/4”	0-10	1-3/4”	0
	No. 4	45-65	No. 4	-
	No. 40	50-70	No. 40	45-65
	Max LL	35	Max LL	35
	Max PI	12	Max PI	12

TYPE E Shell with Sand and Caliche	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %
	1-3/4”	0	1-3/4”	0
	No. 40	45-65	No. 40	45-65
	Max LL	35	Max LL	35

	Max PI	10	Max PI	12
TYPE F Caliche	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %
	1-3/4”	0	1-3/4”	0
	No. 4	45-75	No. 4	50-85
	No. 40	50-85	-	-
	Max LL	40	Max LL	40
	Max PI	12	Max PI	12
TYPE G Crushed Blast Furnace Slag	Retained on Sq. Sieve	Percent %	Retained on Sq. Sieve	Percent %
	As Shown on Plans			

G. The limits establishing reasonable close conformity with the specified gradation and plasticity index are defined by the following:

1. The ENGINEER may accept the material, providing not more than 2 of 10 consecutive gradation tests performed are outside the specified limits on any individual or combination of sieves by no more than 5% and where no two consecutive tests are outside the specified limits.

2. The ENGINEER may accept the material providing not more than 2 of 10 consecutive plasticity index samples tested are outside the specified limit by no more than two points and where no two consecutive tests are outside the specified limit.

2.5 STOCKPILING

A. When specified on the plans, the material shall be stockpiled prior to delivery on the road. The stockpile shall be not less than the height indicated and shall be made up of layers of material not to exceed the depth shown on the plans.

B. After a sufficient stockpile has been constructed as specified on the plans, the CONTRACTOR may proceed with loading from the stock- pile for delivery to the road.

C. In loading from the stockpile for delivery to the road, the material shall be loaded by making successive vertical cuts through the entire depth of the stockpile.

D. If the CONTRACTOR elects to produce the Type a material from more than one material or more than one source, each material shall be crushed separately and placed in separate stockpiles so that at least 75 percent of the material in the course aggregate stockpiles will be retained on the No. 4 sieve and at least 70 percent of the material in the fine aggregate stockpile will pass the No. 4 sieve.

E. The materials shall be combined in a central mixing plant in the proportions determined by the ENGINEER to produce a uniform mixture which meets all of the requirements of the specification. In the event that combinations of the materials produced fail to meet all of the

specification requirements, the CONTRACTOR will be required to secure other materials which will meet specifications requirements.

F. The central mixing plant shall be either the batch or continuous flow type, and shall be equipped with feeding and metering devices which will add the materials into the mixer in the specified quantities.

G. Mixing shall continue until a uniform mixture is obtained.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Type roadbed shall be excavated and shaped in conformity with the typical sections shown on the plans and to the lines and grades as established by the ENGINEER.

B. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material.

C. All holes, ruts and depressions shall be filled with approved material and, if required, the subgrade shall be thoroughly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the base material.

D. The surface of the subgrade shall be finished to line and grade as established and in conformity with the typical section shown on plans, and any deviation in excess of 1/2 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

E. Sufficient subgrade shall be prepared in advance to insure satisfactory prosecution of the work.

F. Material excavated in the preparation of the subgrade shall be utilized in the construction of adjacent shoulders and slopes or other- wise disposed on as directed, and any additional material required for the completion of the shoulders and slopes shall be secured from sources indicated on plans or as directed by the Engineer.

3.2 PLACEMENT OF FIRST COURSE - TYPE A, TYPE B, TYPE C, TYPE F, AND TYPE G MATERIAL

A. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section.

B. The material shall be delivered in approved vehicles of a uniform capacity, and it shall be the charge of the CONTRACTOR that the required amount of specified material shall be delivered in each 100- foot station.

C. Material deposited upon the subgrade shall be spread and shaped the same day.

D. In the event inclement weather or other unforeseen circumstances render impractical the spreading of the material during the first 24-hour period, the materials shall be scarified and spread as directed by the Engineer.

E. The material shall be sprinkled, if directed, and shall then be bladed, dragged and shaped to conform to typical sections as shown on plans.

F. All areas and "nests" of segregated coarse or fine material shall be corrected to removed and replaced with well graded material, as directed by the ENGINEER.

G. If additional binder is considered desirable or necessary after the material is spread and shaped, it shall be furnished and supplies in the amount directed by the ENGINEER. Such binder material shall be carefully and evenly incorporated with the material in place by scarifying, harrowing, brooming or by other approved methods.

H. The course shall be compacted by method of compaction hereinafter specified as the "Ordinary Compaction" method or the "Density Control" method of compaction as indicated on the plans, or as directed by the ENGINEER.

1. When the "Ordinary Compaction" method is to be used, the following provisions shall apply:

a) The course shall be sprinkled as required and rolled ad directed until a uniform compaction is secured. Throughout this entire operation, the shape of the course shall be maintained by blading and the surface upon completion shall be smooth and in conformity with the typical sections shown on plans and to the established lines and grades.

b) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

c) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.

2. When the "Density Control" method of compaction is to be used, the following provisions shall apply:

a) The course shall be sprinkled as required and compacted to the extent necessary to provide not less than the percent density as hereinafter specified under "Density".

b) In addition to the requirement specified for density, the full depth of the flexible base shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment.

c) After each section of flexible base is completed, tests as necessary will be made by the ENGINEER. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.

d) Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to established lined and grades.

e) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

f) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.

I. Should the base course, due to any reason or cause, lose the required stability, density or finish before the surfacing is complete; it shall be recompacted and refinished at the sole expense of the CONTRACTOR.

J. Where Type C material is used, the material shall be scarified, thoroughly wetted, mixed, manipulated, and bladed so as to secure a uniformly wetted material, and pulled in over the subgrade in courses and set under the action of blading and rolling. The work of mixing, blading, rolling, shaping, and subsequent maintenance shall be performed by the continuous use of sufficient number of satisfactory rollers and power maintainers with adequate scarifier attachments.

3.3 PLACEMENT OF FIRST COURSE - TYPE D MATERIAL

A. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section, and corrections made if necessary.

B. All materials shall be delivered in approved vehicles of a uniform capacity.

C. The required amount of shell shall be uniformly spread across the section and allowed to dry sufficiently to insure proper slaking and mixing of the binder material. Immediately upon completion of the drying period, as determined by the ENGINEER, the specified amount of sand admixture as required to produce a combined material meeting the requirements hereinbefore specified shall be spread uniformly across the shell.

D. The material shall then be sprinkled as required and thoroughly mixed by blading and harrowing, or other approved methods.

E. Failure to proceed with the placing of sand admixture or mixing and placing operations will be grounds for the suspension of placing of shell.

F. Under no conditions will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.

G. The course shall be compacted by the method of compaction hereinafter specified as the "Ordinary Compaction" method or the "Density Control" method of compaction as indicated on the plans, or as directed by the ENGINEER.

1. When the plans indicate that the "Ordinary Compaction" method is to be used, the following provisions shall apply:

a) After mixing, all material shall be windrowed, and then spread over the section in layers.

b) The layer shall not exceed 2 inches in loose depth.

c) If necessary to prevent segregation, the material shall be wetted in the window prior to spreading.

d) After each lift is spread, it shall be sprinkled and rolled to secure maximum compaction as directed by the ENGINEER. Succeeding layers shall then be placed similarly until the course is completed.

e) All areas and "nest of segregated coarse or fine material shall be corrected or removed and replaced with well graded material, as directed by the ENGINEER.

f) The course shall then be sprinkled as required and rolled as directed until a uniform compaction is secured.

g) Throughout this entire operation, the shape of the course shall be maintained by blading; and the surface, upon completion, shall be smooth and in conformity with the typical sections shown on plans, and to the established lines and grades.

h) In that area on which pavement is to be place, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

i) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.

2. When the plans indicate that the "Density Control" method of compaction is to be used, the compaction method shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G material.

H. When indicated on the plans or permitted by the ENGINEER, Type D material may be mixed in a central mixing plant and delivered to the road as a combined mixture. When this method is used, the combined mixture shall meet the requirements for type D material as hereinbefore specified and the placing and compaction requirement shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G material.

3.4 PLACEMENT OF FIRST COURSE - TYPE E MATERIAL

A. The construction methods for placing the first course of Type E material shall be the same as prescribed for Type D material except that after the shell and sand have been placed, the prescribed amount of caliche shall then be spread across the sand and shell.

B. The composite mixture shall then be sprinkled as required and thoroughly mixed by blading and harrowing or other approved methods.

C. Compaction of the first course of Type E material shall be the same as prescribed above for Type D material.

D. Failure to proceed with placing the sand and caliche admixture or mixing and placing operations will be grounds for the suspension of placing of shell.

E. Under no conditions will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.

3.5 PLACEMENT OF SUCCEEDING COURSES - ALL MATERIAL TYPES

A. Construction methods shall be the same as prescribed for the first course.

B. Prior to placing the surfacing on the completed base, the base shall be "dry cured" to the extent directed by the ENGINEER.

3.6 DENSITY CONTROL

A. When the "Density Control" method of compaction is indicated on the plans, each course of flexible base shall be compacted to the percent density shown on the plans.

B. The testing will be as outlined in Test Method Tex-114-E.

C. It is the intent of this specification to provide in that part of the base included in the top 8 inches immediately below the finished surface of the roadway not less than 100 percent of the density as determined by the compaction ratio method.

D. Field density determination shall be made in accordance with Test Method Tex-115-E.

3.7 TOLERANCES

A. Flexible base will be measured by the square yard of surface area of completed and accepted work based on the width of flexible base as shown on the plans.

1. The ENGINEER may accept the work providing not more than 25 percent of the density tests performed each day are outside the specified density by no more than three pounds per cubic foot and where no two consecutive tests on continuous work are outside the specified limits.

END OF SECTION 321270

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SECTION 321280 - PRIME COAT

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

A. Prime coat shall consist of application of asphaltic materials on completed base course and/or other approved area, which shall be applied in accordance with these specifications, as shown on the plans, and as directed by the ENGINEER.

1.2 QUALITY ASSURANCE

A. Test and Certification of Bituminous Materials.

1. Bituminous material is to be tested in accordance with the requirements of AASHTO M-82 and sampled in conformance with AASHTO T-40.

2. Supply, at the time of delivery of each shipment of asphalt, two certified copies of test reports, from supplying vendor, to the ENGINEER.

3. Test reports shall indicate name of vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, purchase order number, and result of specified tests. The test report, signed by an authorized representative of the vendor, shall certify that the product delivered conforms to the specifications for type and grade indicated. Certified test reports and the testing required in the preparation of such report shall be at no cost to thee City.

4. Final acceptance of bituminous materials shall be dependent on the determination by the ENGINEER that the material meets prescribed standards.

PART 2- PRODUCTS

2.1 MEDIUM CURING CUTBACK ASPHALT

A. Medium-curing liquid asphalt, designated by the letters MC, shall consist of an uncracked petroleum base stock, produced by the processing of asphaltic or semi-asphaltic base crude petroleum, blended with a kerosene-type solvent. The base stock for all MC materials shall be straight run asphalt produced within the penetration range of 100 to 300, and the end point of the kerosene type solvent shall not exceed 525 degrees F. Medium curing liquid cutback asphalt shall be free from water and show no separation.

B. Medium curing cutback asphalt shall consist of materials specified above and conforming to the requirements set forth in Table 32 12 80-1.

C. Unless otherwise noted on the plans or directed by the ENGINEER, cutback asphalt Grade MC-30 shall be used.

2.2 BLOTTER MATERIAL:

A. Supply blotter material consisting of native sand and/or sweepings from base course.

B. Native sand shall be local material obtained from approved sources as approved by the ENGINEER.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

A. Unless otherwise specified on the plans or, required by the ENGINEER, only asphaltic material shall be used. Where required, a combination of asphaltic and blotter material shall be used.

B. Application of Asphaltic Materials Only.

1. Apply prime coat to prepared surface when ambient air temperature is above 40 degrees F. and is rising and shall not be applied when the ambient air temperature is below 50 degrees F. and falling.

2. Apply prime coat to surfaces that have been cleaned by sweeping or other approved methods and where base is thoroughly dry and satisfactory for receiving prime coat.

3. Apply prime coat to cleaned base, at a rate of 0.2 to 0.5 gallons per square yard of surface area, using an approved type of self-propelled pressure distributor so constructed and operated to distribute the material evenly and smoothly.

4. Provide necessary facilities for the determination of temperature of asphaltic material in all heating equipment and distributors; and for determination of rate at which it is applied; and for securing uniformity at the junction of two distributor loads.

5. Keep in clean and good working condition all storage tanks, piping, reports, booster tanks and distributors used in the storage and handling of asphaltic materials.

6. Operate all associated equipment in a manner such that there is no contamination of asphaltic material with foreign material.

7. Calibrate distributor and furnish ENGINEER with an accurate and satisfactory record of such calibrations.

TABLE 32 12 80-1

Specification Designation	AASHTO Test Method	ASTM Test Method	Grade MC 30	MC 70	MC 250	MC 800	MC 3000
Flash Point (Open Cleve) °F, Min.	T 48	D 92	100	100	150	150	150
Viscosity 140°F, Kinematic, CS	T 201	D 2170	30 to 60	70 to 140	250 to 500	800 to 1600	3000 to 6000
Furol Viscosity	T 72	D 88					
at 77 F. (Secs.)			75-150				
at 122 F. (Secs.)			60-120	300			
at 140 F. (Secs.)			125-250	to			
at 180 F. (Secs.)			100-200	600			
Distillation	T 78	D 402					
Distillate (% of Total Distillate to 680 F)							
to 437 F)			0-25	0-20	0-10	-0-	-0-
to 500 F			40-70	25-60	20-55	10-35	0-15
to 600 F			75-93	75-90	70-85	65-80	50-75
Residue from Distillation to 680 F Volume % by Difference Min.			50	55	67	75	80
Tests on Residue From Distillation Penetration at 77 F	T 49	D 5	120 to 250	120 to 250	120 to 250	120 to 250	120 to 250
*Ductility 77 F cm., Min.	T 51	D 113	100	100	100	100	100
Solubility in CC1 4, % Min.	T44	NONE	99.5	99.5	99.5	99.5	99.5
Water, % Min.	T 55	D 95	0.2	0.2	0.2	0.2	0.2
Reaction to Spot Test	T 102**		-0-	-0-	-0-	-0-	-0-

*If penetration of residue is more than 200 and its ductility at 77 F is less than 100, the material will be acceptable if the ductility at 60 F is greater than 100.

**Using 85% Standard Naphtha and 15% Xylene.

NOTE: Viscosity tests may be made by either Kinematic or Furol test methods.

8. Recalibrates distributor, in a manner satisfactory to the ENGINEER, after the beginning of work, should the yield on the asphaltic material applied appear to be in error.

9. No traffic, hauling or placing of subsequent courses shall be permitted over freshly applied prime coat until authorized by the ENGINEER.

10. Apply asphaltic material at a temperature within 15 F of temperature of application selected by the ENGINEER based on temperature viscosity relationship noted in Table 2610-1.

11. Maintain surface until work is Blotter Material.

C. Application of Asphaltic and Blotter Material

1. Haul blotter material in vehicles of uniform capacity and placed on shoulders at spacings designated by the ENGINEER.

2. After application of asphaltic material as specified above, cover surface with blotter material as directed by the ENGINEER.

3. After application of blotter material, drag surface with approved drag broom, evenly and smoothly distributing the blotter material.

4. Brooming or dragging operation shall continue, as directed by the ENGINEER, until the course has properly cured under traffic.

END OF SECTION 321280

SECTION 321313 - CONCRETE PAVEMENT

PART 1 - GENERAL

1.0 The General Conditions, Special Provisions and applicable requirements of Division 1 - General Requirements are hereby made a part of this section.

1.1 SCOPE: This work consists of street pavement, sidewalk, curb and gutter or rip rap slope pavement composed of Portland Cement Concrete with or without reinforcement, constructed on subgrade or base courses prepared in accordance with these specifications and to the lines, grades, thicknesses and typical cross-sections shown on the plans. Reinforcement, when required, will be subsidiary to the specified Concrete Pavement.

1.2 Submittals shall be in accordance with Section 013300, SUBMITTALS, and shall include:

A. Manufacturer's Literature: Descriptive data of installation methods and procedures.
B. Certificates: Manufacturer's certification that materials meet specification requirements.

PART 2 - PRODUCTS

2.0 Portland cement concrete shall conform to the requirements of "Section 321313 – Concrete Pavement" for each type and strength indicated in the plans.

2.1 JOINT FILLER AND SEALER: Joint sealants and expansion joint filler materials shall conform to "Item #433, JOINT SEALANTS & FILLERS" in the 1993 edition of TXDOT Standard Specifications for Construction of Highways, Streets and Bridges.

2.2 STEEL REINFORCEMENT: Reinforcing bars shall conform to the requirements of AASHTO M31 or M53, Grade 60. Fabricated bar mats may be used if they conform to the requirements of AASHTO M54.

2.3 DOWELS AND TIE BARS: Dowels and tie bars shall conform to the requirements of AASHTO M31 or M53, Grade 60 or Grade 40, as specified on the plans. Tie bars shall be deformed meeting the requirements of AASHTO M31 or M53. Dowel and tie bars may conform to the requirements of AASHTO M 42, except that rail steel shall not be used for tie bars that are to be bent or restraightened during construction. Dowel bars shall be plain round bars of the size specified and the ends shall be sawed. Before delivery to the construction site, a minimum of two-thirds of the length of each dowel bar shall be painted with one coat of lead or tar paint. Prior to placement of concrete, the dowels shall be coated with grease if specified on the plans.

2.4 WATER: Water used in mixing or curing shall be as clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product as possible. Water will be tested in accordance with the requirements of AASHTO Method T26. Water known to be of potable quality may be used without testing.

2.5 COVER MATERIALS FOR CURING: Curing materials shall conform to one of the following specifications:

A. "Sheet Materials for Curing Concrete" shall conform to AASHTO M171.
B. "Burlap Cloth Made from Jute or Kenat" shall conform to AASHTO M182, Class 3.
C. "Liquid Membrane - Forming Compounds for Curing Concrete" shall conform to AASHTO M148, Type 2 (all-resin base), or Federal Specification TT-C-800, Type 2. Liquid Membrane shall be delivered and stored in bulk. Bulk storage shall be equipped with an agitator. All membranes shall be pigmented to allow visible inspection of coverage.

2.6 POZZOLANIC ADMIXTURE: The use of fly ash as a partial replacement for cement in pavement mix designs, at the rate specified in this paragraph will be allowed at the Contractor's option. Pozzolanic admixtures shall be fly ash meeting the requirements of ASTM C-618; Type C except loss on ignition shall not exceed three (3) percent. When fly ash is used as a partial replacement for cement, the minimum cement content may be met by considering portland cement plus fly ash as the total cementitious component. The replacement rate should not exceed 15 percent.

PART 3 - EXECUTION

3.1 EQUIPMENT: Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition. The equipment shall be at the job site before the start of construction operations for examination and approval.

A. Batching Plant and Equipment.

1. General. The batching plant shall include bins, weighing hoppers, and scales for the fine aggregate and coarse aggregate. If bulk cement is used, a bin, hopper, and a separate scale for cement shall be included. The weighing hoppers shall be properly sealed and vented to preclude dusting during operation.

2. Bins and Hopper. Bins with adequate separate compartments for fine aggregate and coarse aggregate shall be provided in the batching plant. Each compartment shall discharge efficiently and freely into the weighing hopper. Means of control shall be provided so that, as the quantity desired in the weighing hopper is approached, the material may be added slowly and shut off with precision. A port or other opening for removing an overload of any one of the several materials from the hopper shall be provided. Weighing hoppers shall be constructed to eliminate accumulations of materials and to discharge fully.

3. Scales. The scales for weighing aggregates and cement shall be of either the beam or the springless dial type. They shall be accurate within 0.5 percent throughout their range of use. When beam-type scales are used, provisions such as a "telltale" dial shall be made for indicating to the operator that the required load in the weighing hopper is being approached. A device on the weighing beams shall clearly indicate critical position. Poises shall be designed to be locked in any position and to prevent unauthorized change. The weight beam and "telltale" device shall be in full view of the operator while charging the hopper, and the operator shall have convenient access to all controls.

Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy. The Contractor shall have on hand not less than ten 50-pound (23 kg) weights for testing of all scales when directed by the Engineer.

B. Mixers.

1. General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

A device accurate within 3 percent and satisfactory to the Engineer shall be provided at the mixer for determining the amount of air-entraining agent or other admixture to be added to each batch requiring such admixtures.

Mixers shall be examined daily for the accumulation of hard concrete or mortar and the wear of blades.

2. Central Plant Mixer. Mixing shall be in an approved mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging the mixture without segregation. Central plant mixers shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed. The water system for a central mixer shall be either a calibrated measuring tank or a meter and shall not necessarily be an integral part of the mixer.

The mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4-inch (19 mm) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

3. Truck Mixers and Truck Agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

C. Finishing Equipment.

1. Finishing Machine. The finishing machine shall be equipped with one or more oscillating-type transverse screeds.

2. Vibrators. For side-form construction, vibrators may be either the surface pan type for pavements less than 8 inches (20 cm) thick or the internal type
with either immersed tube or multiple spuds, for the full width of the concrete slab. They may be attached to the spreader or the finishing machine, or they may be mounted on a separate carriage. They shall not come in contact with the joint, load-transfer devices, subgrade, or side forms. The frequency of the surface vibrators shall not be less than 3,500 vibrations per minute, and the frequency of the internal type shall not be less than 7,000 vibrations per minute for spud vibrators. When

spud-type internal vibrators are used adjacent to the side forms, they shall have a frequency of not less than 3,500 vibrations per minute. Hand vibrators should be used to consolidate the concrete along forms and other isolated areas.

For slip-form construction, the paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Vibration shall be accomplished by internal vibrators with a frequency range variable between 7,000 and 12,000 vibrations per minute. The amplitude of vibration shall be between 0.025 (0.6 mm) and 0.06 (1.5 mm) inches.

The number, spacing, frequency, and eccentric weights shall be provided as necessary to achieve an acceptable concrete density and finishing quality. Adequate power to operate all vibrators at the weight and frequency required for a satisfactory finish shall be available on the paver. The internal vibrators may be supplemented by vibrating screeds operating on the surface of the concrete. The frequency of surface vibrators shall not be less than 3,500 vibrations per minute. The Contractor shall furnish a tachometer or other suitable device for measuring the frequency of the vibrators. The vibrators and tamping elements shall be automatically controlled so that they shall be stopped as forward motion ceases. Any override switch shall be of the springloaded, momentary contact type.

For hand placed pavement the contractor shall consolidate concrete with the use of a hand held vibrator regardless of the type of strike off machinery used. Vibration shall be done to sufficiently remove air voids and consolidate concrete around reinforcing steel and side forms. **VIBRATORS SHALL NOT BE USED TO DISTRIBUTE CONCRETE**. The contractor shall limit disturbances of consolidated concrete during strike-off and finishing by using adequately sized floats and straight edges as approved by the Engineer. Vibrators, floats, and finishing tools to be on job site at all times during concrete placement.

3. Concrete Saw. When sawing of joints is specified, the Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and at the required rate. The Contractor shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations. The Contractor shall provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and at all times during concrete placement.

4. Forms. Straight side forms shall be made of steel having a thickness of not less than 7/32 inch (6 mm) and shall be furnished in sections not less than 10 feet (3 m) in length. Forms shall have a depth equal to the prescribed edge thickness of the concrete without horizontal joint, and a base width equal to the depth of the forms. Flexible or curved forms of proper radius shall be used for curves of 100-foot (31 m) radius or less. Flexible or curved forms shall be of a design acceptable to the Engineer. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Flange braces shall extend outward on the base not less than two-thirds the height of the form. Forms

with battered top surfaces and bent, twisted, or broken forms shall be removed from the work. Repaired forms shall not be used until inspected and approved. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4-inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting.

5. Slip-form Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

3.2 FORM SETTING: Forms shall be set sufficiently in advance of the concrete placement to insure continuous paving operation. After the forms have been set to correct grade, the grade shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place with not less than 3 pins for each 10-foot (3 m) section. A pin shall be placed at each side of every joint.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/4-inch (6 mm) at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

CONDITIONING OF UNDERLYING COURSE AND REINFORCING: The prepared grade shall be well moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Ruts or depressions in the subgrade or subbase caused by hauling or usage of other equipment shall be filled as they develop with suitable material (not with concrete or concrete aggregates) and thoroughly compacted by rolling. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor, or the damaged areas filled with concrete integral with the pavement. All excess material shall be removed. Low areas may be filled and compacted to a condition similar to that of the surrounding grade, or filled with concrete integral with the pavement. In cold weather, the underlying subbase shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying material will not be permitted. The work described under the foregoing paragraphs does not constitute a regular subgrading operation, but rather a final accurate check of the underlying course.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale, or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile

properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements and provided the rust or scale is not loose. Reinforcing bars shall be securely wired together at all intersections and splices and shall be securely wired to each dowel and load transmission unit intersected. All bars shall be installed in their required position as shown on the plans.

3.3 MIXING CONCRETE: The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C94, except that the minimum required revolutions of the mixing speed for transit mixed concrete may be reduced to not less than that recommended by the mixer manufacturer. The number of revolutions recommended by the mixer manufacturer shall be indicated on the manufacturer's serial plate attached to the mixer.

When mixed at the work site or in a central mixing plant, the mixing time shall not be less than 50 seconds nor more than 90 seconds. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

The mixer shall be operated at the drum speed as shown on the manufacturer's nameplate on the approved mixer. Any concrete mixed less than the specified time shall be discarded at the Contractor's expense. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic feet (cubic meters), as shown on the manufacturer's standard rating plate on the mixer. An overload up to 10 percent above the mixer's nominal capacity may be permitted provided concrete test data for segregation and uniform consistency are satisfactory, and provided no spillage of concrete takes place. The batch shall be charged into the drum so that a portion of the mixing water shall enter in advance of the cement and aggregates. The flow of water shall be uniform, and all water shall be in the drum by the end of the first 15 seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the free flow of materials into the drum.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or nonagitating trucks. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in nonagitating trucks, nor 60 minutes when the concrete is hauled in truck mixers or truck agitators. Retempering concrete by adding water or by other means will not be permitted, except when concrete is delivered in transit mixers. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements, if permitted by the Engineer. All these operations must be performed within 45 minutes after the initial mixing operations and the water-cement ratio must not be exceeded. Admixtures for increasing the workability or for accelerating the set will be permitted only when specified for in the contract.

3.4 LIMITATIONS OF MIXING: No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40 degrees F (4

degrees C) and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35 degrees F (2 degrees C).

When concreting is authorized during cold weather, the aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials. Unless otherwise authorized, the temperature of the mixed concrete shall not be less than 50 degrees F (10 degrees C) at the time of placement in the forms.

If the air temperature is 35 degrees F (2 degrees C) or less at the time of placing concrete, the Engineer may require the water and/or the aggregates to be heated to not less than 70 degrees F (21 degrees C) nor more than 150 degrees F (66 degrees C). Concrete shall not be placed on frozen subgrade nor shall frozen aggregates be used in the concrete.

During periods of warm weather when the maximum daily air temperature exceeds 85 degrees F (30 degrees C), the following precautions should be taken. The forms and/or the underlying material shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90 degrees F (32 degrees C). The aggregate and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

3.5 PLACING CONCRETE:

A. Side-form Method: For the side-form method, the concrete shall be deposited on the moistened grade to require as little rehandling as possible. Unless truck mixers, truck agitators, or nonagitating hauling equipment are equipped with means for discharge of concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade to prevent segregation of the materials. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels -- **NOT RAKES**. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

Concrete for side-form construction shall be placed on cement treated base. No concrete shall be placed before the cement treated base has obtained a compressive strength specified at 7 days.

When concrete is to be placed adjoining a previously constructed lane of pavement and when mechanical equipment will be operated upon the existing lane of pavement, the concrete shall be at least 7 days old and at a flexural strength approved by the Engineer. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after 3 days, if approved by the Engineer.

Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 15 seconds in any one location, nor shall the vibrators be used to move the concrete. Concrete shall be deposited as near to expansion and contraction joints as possible without disturbing them but

shall not be dumped from the discharge bucket or hopper onto a joint assembly unless the hopper is well centered on the joint assembly.

Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately by approved methods.

B. Slip Form Method. For the slip-form method, the concrete shall be placed with an approved crawler-mounted, slip-form paver designed to spread, consolidate, and shape the freshly placed concrete in one

Complete pass of the machine so that a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement in conformance with requirements of the plans and specifications. The concrete should be placed directly on top of the joint assemblies to prevent them from moving when the paver moves over them. Side forms and finishing screeds shall be adjustable to the extent required to produce the specified pavement edge and surface tolerance. The side forms shall be of dimensions, shape, and strength to support the concrete laterally for a sufficient length of time so that no appreciable edge slumping will occur. Final finishing shall be accomplished while the concrete is still in the plastic state.

Concrete for slip form construction shall be placed on cement treated base or lime stabilized subgrade. No concrete shall be placed before the cement treated base has obtained the compressive strength specified at 7 days. The Contractor shall set grade stakes and stringline for each lane placement. The stringline shall be supported at intervals of not more than 25 feet. Additional supports shall be installed to prevent sag of the stringline. The horizontal alignment of the stringline shall be within plus or minus 1/4-inch in 10 feet of true alignment. The Contractor shall provide a suitable method of securing the stringline to maintain proper grade where vertical curves are to be constructed.

C. Hand Placement Method. When the hand method of striking off and consolidating is permitted, the concrete, as soon as placed, shall be approximately leveled and then truck off and screeded to such elevation above grade that, when consolidated and finished, the surface of the pavement shall be at the grade elevation shown on the plans. The entire surface shall then be tamped and the concrete consolidated so as to insure maximum compaction and a minimum of voids. For the strike off and consolidation, both a strike template and tamping template shall be provided on the work. In operation the strike template shall be moved forward with a combined longitudinal and transverse motion and so manipulated that neither end of the template is raised from the forms during the striking-off process. A slight excess of material shall be kept in front of the cutting edge at all times. The straightedging, surfacing and joint finishing shall be as described herein.

3.7 STRIKE-OFF OF CONCRETE: Following the placing of the concrete, it shall be struck off to conform to the cross section shown on the plans and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. All reinforcement shall be positioned in advance of concrete placement. All reinforcing bars and bar mats shall be installed in the slab at the required depth below the finished surface and supported by chairs installed on 4-foot centers. After the reinforcing steel is securely installed above the subgrade, as specifically required by plans and as herein prescribed, there shall be no loading imposed upon (or walking upon) the bar mats or individual bars that will cause deformation of reinforcing before or during the placing or finishing of the concrete.

3.8 JOINTS.

A. General:

A. Longitudinal and Transverse Joints. Longitudinal and transverse joints shall be constructed as indicated on the plans and in accordance with these requirements. All joints shall be constructed true to line with their faces perpendicular to the surface of the pavement. Joints shall not vary more than 1/2-inch (13 mm) from a true line or from their designated position. The vertical surface of the pavement adjacent to all expansion joints shall be finished to a true plane and edged to a radius of 1/4-inch (6 mm) or as shown on the plans. The surface across the joints shall be tested with a 10-foot (3 m) straightedge as the joints are finished and any irregularities in excess of 1/4-inch (6 mm) shall be corrected before the concrete has hardened. Longitudinal construction joints that do not meet these requirements or which show significant cracking or planes of weakness shall be sawed-off full depth at the Contractor's expense using the minimum practical width at locations designated by the Engineer. When required, keyways shall be accurately formed with a template of metal or wood. The gauge or thickness of the material in the template shall be such that the full keyway, as specified, is formed and is in the correct location. Transverse joints shall be right

B. Angles to the centerline of the pavement and shall extend the full width of the slab. All joints shall be so prepared, finished, or cut to provide a groove of the width and depth shown on the plans.

B. Tie Bars: Tie bars shall consist of deformed bars installed principally in longitudinal joints as shown on the plans or the bars shall be extensions of the distributed reinforcing steel across the joints. Tie bars shall be placed at right angles to the centerline of the concrete slab. They shall be held in position parallel to the surface and midway between the surfaces of the slab. These bars shall not be painted, greased, or enclosed in sleeves. At all locations where tie bars are specified and where pavement is in place, the tie bars shall be inserted by drilling and grouting with approved epoxy material. Tie bars in longitudinal construction joints may be installed by bending the bars flush with a keyed joint.

C. Dowel Bars: If used, dowel bars or other load-transfer units of an approved type shall be placed across transverse or other joints in the manner as specified on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. A metal, or other type, dowel expansion cap or sleeve shall be furnished for each dowel bar used with expansion joints. These caps shall be substantial enough to prevent collapse and shall be placed on the ends of the dowels as shown on the plans. The caps or sleeves shall fit the dowel bar tightly and the closed end shall be watertight.

D. Installation: Joints in concrete pavements shall be cut as shown on the plans. Equipment shall be as described in Paragraph 3.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8-inch (3 mm) wide and to the depth shown on the plans. When shown on the plans or required by the specifications, the top portion of the slot or groove shall be widened by means of a second shallower cut or by

suitable and approved beveling to provide adequate space for joint sealers. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing. Sawing shall be carried on both during the day and night as required. The joints shall be sawed at the required spacing consecutively in sequence of the concrete placement, unless otherwise approved by the Engineer.

D. Longitudinal Joints.

1. Construction. Longitudinal construction joints shall be formed against suitable side forms (usually made of steel) with or without keyways. Wooden forms may be used under special conditions, when approved by the Engineer. Where butt-type joints with dowels are designated, the dowels for this type shall be painted and greased. The edges of the joint shall be finished with a grooving tool or edging tool, and a space or slot shall be formed along the joint of the dimensions, as indicated, to receive the joint sealing material. Longitudinal construction joints shall be sawed to provide a groove at the top conforming to the details and dimensions indicated on the plans. Provisions shall be made for the installation of tie bars as noted on the plans.

2. Contraction or Weakened-plane type. The longitudinal groove sawed in the top of the slab shall be installed where indicated on the drawings. The groove shall be sawed with approved equipment in the hardened concrete to the dimensions required. The sawed groove shall be straight and of uniform width and depth. The groove shall be clean cut so that spalling will be avoided at intersections with transverse joints. Tie bars or distributed reinforcing steel shall be installed across these joints were indicated on the plans.

3. Expansion. Longitudinal expansion joints shall be installed as indicated on the plans. The premolded filler, of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic.

E. Transverse Joints.

1. Expansion. Transverse expansion joints shall be installed at the locations and spacing as shown on the plans. The joints shall be installed at right angles to the centerline and perpendicular to the surface of the pavement. The joints shall be installed and finished to insure complete separation of the slabs. Expansion joints shall be of a premolded type conforming to these specifications and with the plans and shall be the full width of the pavement strip.

All concrete shall be cleaned from the top of the joint material. Before the pavement is opened to traffic, this space shall be swept clean and filled with approved joint sealing material.

All devices used for the installation of expansion joints shall be approved by the Engineer. They shall be easily removable without disturbing the concrete and held in proper transverse and vertical alignment. Immediately after forms are removed, any concrete bridging the joint space at the ends shall be removed for the full width and depth of the joint.

When specified, expansion joints shall be equipped with dowels of the dimensions and at the spacing and location indicated on the plans. The dowels shall be firmly supported in place and accurately aligned parallel to the subgrade and the centerline of the pavement by means of a dowel assembly which will remain in the pavement and will ensure that the dowels are not displaced during construction.

Other types of load-transfer devices may be used, when approved by the Engineer.

2. Contraction. Transverse contraction joints, weakened-plane joints, or both, shall be installed at the locations and spacing as shown on the plans. These joints will be installed by sawing a groove into the concrete surface after the concrete has hardened in the same manner as specified in Paragraph 3.8(c)(2). Dowel bar assemblies shall be installed, when required, as shown on the plans.

3. Construction. Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. When the installation of the joint can be planned in advance, it shall be located at a contraction or expansion joint. The joint shall not be allowed within 8 feet (2.4 m) of a regular spaced transverse joint. If the pouring of the concrete has been stopped, causing a joint to fall within this limit, it shall not be installed, and the fresh placed concrete shall be removed back to the 8 foot (2.4 m) limit.

3.9 FINAL STRIKE-OFF, CONSOLIDATION, AND FINISHING:

A. Sequence. The sequence of operations shall be the strike-off and consolidation, floating and removal of laitance, straightedging, and final surface finish. **The addition of superficial water to the surface of the concrete to assist in finishing operations generally will not be permitted**. If the application of water to the surface is permitted, it shall be applied as a fog spray by means of approved spray equipment.

B. Finishing at Joints. The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material; it shall be firmly placed without voids or segregation under and around all load-transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated. After the concrete has been placed and vibrated adjacent to the joints, the finishing machine shall be operated in a manner to avoid damage or misalignment of joints. If uninterrupted operations of the finishing machine, to, over, and beyond the

joints, cause segregation of concrete, damage to, or misalignment of the joints, the finishing machine shall be stopped when the screed is approximately 8 inches (20 cm) from the joint. Segregated concrete shall be removed from the front of and off the joint; the screed shall be lifted and set directly on top of the joint, and the forward motion of the finishing machine shall be resumed. Thereafter, the finishing machine may run over the joint without lifting the screed, provided there is no segregated concrete immediately between the joint and the screed or on top of the joint.

C. Machine Finishing. The concrete shall be spread as soon as it is placed, and it shall be struck off and screeded by an approved finishing machine. The machine shall go over each area as many times and at such intervals as necessary to give the proper consolidation and to leave a surface of uniform texture. Excessive operation over a

given area shall be avoided. When side forms are used, the tops of the forms shall be kept clean by an effective device attached to the machine, and the travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation tending to affect the precision finish. During the first pass of the finishing machine, a uniform ridge of concrete shall be maintained ahead of the front screed for its entire length. When in operation, the screed shall be moved forward with a combined longitudinal and transverse shearing motion, always moving in the direction in which the work is progressing, and so manipulated that neither end is raised from the side forms during the striking-off process. If necessary, this shall be repeated until the surface is of uniform texture, true to grade and cross section, and free from porous areas.

D. Hand Finishing. Hand finishing methods will not be permitted, except under the following conditions: In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade; in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Concrete, as soon as placed, shall be struck off and screeded. An approved portable screed shall be used.

The screed for the surface shall be at least 2 feet (0.6 m) longer than the maximum width of the slab to be struck off. It shall be of approved design, sufficiently rigid to retain its shape, and shall be constructed either of metal or of other suitable material covered with metal. Wood will not be permitted. Consolidation shall be attained by the use of a suitable vibrator.

E. Floating. After the concrete has been struck off and consolidated, it shall be further smoothed, trued, and consolidated by means of a longitudinal float, using one of the following methods:

1. Hand Method. The hand-operated longitudinal float shall not be less than 12 feet (3.6 m) in length and 6 inches (15 cm) in width, properly stiffened to prevent flexibility and warping. The longitudinal float, operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing motion, while held in a floating position parallel to the slab centerline and passing gradually from one side of the slab to the other. Forward movement along the centerline of the slab shall be in successive advances of not more than one-half the length of the float. Any excess water or soup material shall be wasted over the slab edge on each pass.

2. Mechanical Method. The Contractor may use a machine composed of a cutting and smoothing float(s), suspended from and guided by a rigid frame. The frame shall be carried by four or more visible wheels riding on, and constantly in contact with, the side forms or pavement subgrade. If necessary, long-handled floats having blades not less than 5 feet (1.5 m) in length and 6 inches (1.5 cm) in width may be used to smooth and fill in open-textured areas in the slab. Long-handled floats shall not be used to float the entire surface of the slab in lieu of mechanical methods. After floating, any excess water and laitance shall be removed from the surface of the slab by a straightedge 10 feet (3 m) or more in length. Successive drags shall be lapped one-half the length of the blade.

F. Straight-edge Testing and Surface Correction. After the pavement has been struck off and consolidated and while the concrete is still plastic, it shall be tested for trueness with a 16-foot (4.8 m) straightedge. For this purpose the Contractor shall furnish and use an accurate 16-foot (4.8 m) straightedge swung from handles 3 feet (0.4 m) longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance shall be removed from the surface of the pavement. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the requirements for smoothness. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

3.10 SURFACE TEXTURE: A light broom drag shall be used for slab concrete pavements. The direction of the texture device shall be as directed by the Engineer. Contractor to match existing pavement finishes.

3.11 SURFACE TEST: As soon as the concrete has hardened sufficiently, the pavement surface shall be tested with a 16-foot (5 m) straightedge or other specified device to determine its compliance with design grades. Where the departure from correct cross section exceeds ½ inch (13 mm), the pavement shall be ground down with a approved grinding machine to within 1/4 inch of tolerance or removed and replaced at the expense of the Contractor when so directed by the Engineer. Cracked or damaged slabs shall be removed and replaced at the expense of the Contractor when so directed by the Engineer.

Any area or section so removed shall not be less than 20 feet (6 m) in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, and remaining portion of a slab adjacent to the joints that is less than 10 feet (3 m) in length shall also be removed and replaced.

3.12 CURING: Immediately after the finishing operations have been completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured in accordance with one of the methods below. In all cases in which curing requires the use of water, the curing

shall have prior right to all water supply or supplies. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period. The following are alternate approved methods for curing concrete pavements.

A. Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of 1 gallon (4 liters) to not more than 150 square feet (14 square meters). The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by effective mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. Curing compound shall not be applied to the inside faces of joints to be sealed, but approved means shall be used to insure proper curing for 72 hours. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound. Upon removal of the side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. For the Impervious Membrane Method, the Contractor is encouraged to include Polyethylene Film dispensing equipment in the Paving Train to provide protection to the finished work in case of rainfall.

B. Polyethylene Films. The top surface and sides of the pavement shall be entirely covered with polyethylene sheeting. The units shall be lapped at least 18 inches (457 mm). The sheeting shall be placed and weighted to cause it to remain in contact with the surface covered. The sheeting shall have dimensions that will extend at least twice the thickness of the pavement beyond the edges of the pavement. Unless otherwise specified, the sheeting shall be maintained in place for 72 hours after the concrete has been placed.

C. Waterproof Paper. The top surface and sides of the pavement shall be entirely covered with waterproofed paper. The units shall be lapped at least 18 inches (457 mm). The paper shall be placed and weighted to cause it to remain in contact with the surface covered. The paper shall have dimensions that will extend at least twice the thickness of the pavement beyond the edges of the slab. The surface of the pavement shall be thoroughly wetted prior to placing of the paper. Unless otherwise specified, the paper shall be maintained in place for 72 hours after the concrete has been placed.

D. White Burlap-Polyethylene Sheets. The surface of the pavement shall be entirely covered with sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully wetted and in position for 72 hours after the concrete has been placed.

E. Curing in Cold Weather. When the average daily temperature is below 40 degrees F (4 degrees C), curing shall consist of covering the newly laid pavement with not less than 12 inches (30 cm) of loose, dry hay or straw, or equivalent protective curing authorized by the Engineer, which shall be retained in place for 10 days. The hay or straw shall be secured to avoid being blown away. Admixture for curing or temperature control may be used only when authorized by the Engineer.

When concrete is being placed and the air temperature may be expected to drop below 35 degrees F (2 degrees C), a sufficient supply of straw, hay, grass, or other suitable blanketing material such as burlap or polyethylene shall be provided along the work. Any time the temperature may be expected to reach the freezing point during the day or night, the material so provided shall be spread over the pavement to a sufficient depth to prevent freezing of the concrete. The period of time such protection shall be maintained shall not be less than 10 days. A minimum of 3 days is required when high, early strength concrete is used. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather, and any concrete injured by frost action shall be removed and replaced at the Contractor's expense.

3.13 REMOVING FORMS: Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has set for at least 12 hours, except where auxiliary forms are used temporarily in widened areas. Forms shall be removed carefully to avoid damage to the pavement. After the forms have been removed, the sides of the slab shall be cured as outlined in one of the methods indicated in Paragraph 3.17. Major honeycombed areas shall be considered as defective work and shall be removed and replaced. Any area or section so removed shall not be less than 20 feet (6 m) in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 10 feet (3 m) in length shall also be removed and replaced.

3.14 SEALING JOINTS: The joints in the pavement shall be prepared and sealed in strict accordance with the sealant manufacturer's printed recommendations.

3.15 PROTECTION OF PAVEMENT: The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, or crossovers, etc. The plans or special provisions will indicate the location and type of device or facility required to protect the work and provide adequately for traffic. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense. In order that the concrete be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor is encouraged to have available at all times materials for the protection of edges and surface of the unhardened concrete. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel should begin covering the surface of the unhardened concrete with the protective covering.

3.16 OPENING TO TRAFFIC: The Engineer shall decide when the pavement shall be opened to traffic. The pavement will not be opened to traffic until test specimens molded and cured in accordance with

ASTM C31 have attained a flexural strength of 550 pounds per square inch (3792 kPa) when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening to traffic, the pavement shall be thoroughly cleaned.

3.17 SURFACE AND THICKNESS TOLERANCES: Extreme care must be exercised in all phases of the operation to assure the pavement will pass the specified tolerances. The following tolerances are applicable:

A. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot (30 mm) in any lane.

B. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot (12 mm) at any point.

C. Surface smoothness deviations shall not exceed 3/8 inch (6 mm) from a 16-foot (5 m) straightedge placed in any direction, including placement along and spanning any pavement joint or edge.

No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required by plans.

3.18 INTEGRAL CURBS: Where shown on the drawings, integral curbs shall be installed to the dimension shown using identical concrete to the paving mix. Expansion and contraction joints shall extend through curb section. Reinforcing for integral curb, when shown on the plans, shall be supported from the ground with driven stakes or as directed by the Engineer. Once the forms are removed, all voided areas shall be rubbed and filled with non-shrink grout within 24 hours. If the forms are removed within 2 days of placement, the curb shall be treated with a specified curing membrane.

3.19 CONCRETE CURB AND GUTTER: Concrete curb and gutter shall be constructed using concrete of the type and strength specified in the plans. The placement, strike-off consolidation and finishing shall be made using applicable portions of this specification as determined by the Engineer. Contraction joints shall be placed at 20-foot centers with the use of a 1/2" deep grooving tool. Expansion joints shall be placed at a maximum spacing of 400 feet and at all radius points, curb returns and junctions with structures. For curves of 100 feet radius or less, contraction joints shall be tooled at 10-foot centers and expansion joints constructed at 50-foot centers. Expansion joints shall contain a minimum of two smooth dowels a minimum of one bar size larger than the longitudinal reinforcing and 3/4-inch thick expansion joint material of the type specified in the plans. Expansion joints shall be sealed in accordance with the plan details.

3.20 SIDEWALKS AND SLOPE PAVING: Concrete sidewalks and slope paving shall be constructed to use concrete of the type and strength specified in the plans. The placement, strike-off, consolidation and finishing shall be made using applicable portions of this specification as determined by the Engineer. Contraction joints shall be tooled at a depth of 1/2" at a spacing equal to the width of the sidewalk not to exceed six feet. For walks wider than six feet, longitudinal joints shall be tooled at equal spacing, not less than three feet. Edges shall be tooled with a 1/4-inch radius and finish slightly higher than adjacent curbs to ensure proper drainage if some settlement occurs. Expansion joints shall be placed at 100-foot intervals or at intersecting walk locations. Expansion joints shall be 3/4-

inch in thickness and contain smooth dowels at not less than 12" spacing. The size of the dowels will be equal to the thickness of the sidewalk in inches. Scoring and tooling for barrier free ramps shall be made in accordance with governing City standards or as directed by the Engineer.

3.21 FIELD TEST SPECIMENS: Concrete samples shall be furnished by the Contractor and shall be taken in the field to determine the consistency, air content, and strength of the concrete. Compressive test cylinders shall be made each day that the concrete is placed.
However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix design is changed, additional groups of test cylinders may be required until the Engineer is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test ages will be 7 days and 28 days.

Test cylinders for compressive strength tests shall be taken and cured in accordance with ASTM C-31 and tested in accordance with ASTM C-39. At least four cylinders (a set) shall be made for each 1,000 cubic yards or fraction thereof placed and tested at 7 days and 28 days. No extra compensation will be allowed for materials and work involved in fulfilling these requirements. Concrete will be accepted on the basis of tests conducted on a "lot" of concrete. A lot will consist of 160 cubic yards and will be divided into four equal sublots. One set of tests will be made for each sublot. Random samples will be taken from the plastic concrete at the site in accordance with accepted statistical procedures.

The concrete shall be sampled in accordance with ASTM C172.

The lot will be accepted without adjustment in payment if the average 28 day compressive strength, based on four acceptance tests, indicates a strength deficiency of not less than 100 psi. The pay factor for 28-day compressive strengths showing a deficiency greater than 100 psi are listed in the table below.

PAY FACTOR SCHEDULE FOR COMPRESSIVE STRENGTH
AT THE SPECIFIED INTERVAL

Strength Deficiency (Based on an Average of 4 Cylinders) psi	Pay Factor (Percent of Contract Unit Price) psi
0 - 100	100
100 - 150	85
151 - 200	75
201 - 250	70
251 - 300	60
301 - 375	55
375 - 500	50
>500	Reject

END OF SECTION 321313

SECTION 323000 - CAST-IN-PLACE CONCRETE FOR SITE WORK

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK COVERED

A. Mixing, placing, finishing and providing all related services necessary to construct all cast-in-place concrete work indicated on plans.

1.2 QUALITY ASSURANCE

A. Comply with the latest published edition of the American Concrete Institute (ACI) and American Society of Testing and Materials (ASTM) standards and codes:

1. ACI 315 - Manual of Standard practice for Detailing.
2. ACI 318 - Building Code Requirements for Reinforced Concrete.
3. ACI 347 - Recommended Practice for Concrete Formwork.
4. ASTM A36 - Structural Steel.
5. ASTM C33 - Concrete Aggregates.
6. ASTM C39 - Concrete Strength of Molded Concrete Cylinders.
7. ASTM C94 - Ready-Mixed Concrete.
8. ASTM C143 - Slump of Portland Cement Concrete.
9. ASTM C150 - Portland Cement.
10. ASTM C309 - Liquid Membrance-Forming Compounds for Curing Concrete.
11. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
12. ACI 301 - Specification for Structural Concrete for Building.

B. Submit compliance submittals as specified in Division 1, including but not limited to the following: bar schedule, bar details, shop drawings including size and location of openings, waterstops, joint systems and curing method.

C. Submit proposed concrete mix proportions to Engineer prior to placing concrete.

1.3 SUBMITTALS

A. Conform to requirements of section 013300 SUBMITTALS.

B. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.

C. Certificates: Manufacturer's certification that products meet specification requirements.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

A. Type I, Type II or Type III conforming to ASTM C150 as modified by Texas State Department of Highways and Public Transportation, Most Recent Edition Standard Specifications.

B. Type I or II cement may be used unless Type II is specified.

C. Except when Type II specified, Type III may be used when the anticipated air temperature for the succeeding 12 hours will not exceed 60˚F.

D. Type III may be used in all pre-cast pre-stressed concrete except in piling when Type II cement is required for substructure concrete.

E. All cement used in a monolithic placement shall be of the same type.

F. May be either bagged or bulk. Partially set or caked cement will be rejected.

G. All types of cements shall be "low alkali" cements.

2.2 WATER:

A. Clear, fresh, free from injurious amounts of oil, alkaline, acid or organic matter or other deleterious substances and shall not contain more than 1000 parts per million of chlorides as C1 nor more than 1000 parts per million of sulfates as SO_4.

B. Water of known potable quality requires no testing. Other sources shall meet the requirements of AASHTO T-26.

C. Water shall have a pH of not less than 4.5 or more than 8.5.

2.3 FINE AGGREGATE

A. Natural sand, manufactured sand or a combination of the two, with or without mineral filler.

B. The sand, or mixture of sand, comprising a single fine aggregate, shall consist of clean, hard, durable, uncoated grains and shall be essentially free from clay lumps, salt or alkali, and other foreign material.

C. The maximum permissible percentage, by weight of deleterious substances shall not exceed the following:

Material removed by decantation	3.0%
Other deleterious substances such as coal, shale, coated grains and soft flaky particles	3.0%

An additional loss of 2% by decantation may be allowed, provided this new additional loss is material of the same quality as specified for fine aggregate or mineral filler.

D. Gradation, percent of weight retained:

Sieve Size	Percent Retained
3/8 inch	0
No. 4	0 - 5
No. 8	0 - 20
No. 16	15 - 50
No. 30	35 - 75
No. 50	65 - 90

No. 100	90 - 100
No. 200	97 – 100

E. Fineness Modulus:

1. For Grade 1 only - 2.3 minimum, 3.1 maximum.

F. Mineral Filler:

1. May be added upon written authorization of Engineer
2. Shall be stone dust or clean crushed sand, or other approved inert material.
3. Shall not exceed 5% of the fine aggregate.
4. Shall meet the following requirements:
   a. Passing No. 30 sieve 95 to 100%
   b. Passing No. 100 sieve 70 to 100%

2.4 COARSE AGGREGATE

A. Crushed stone, gravel, crushed gravel, crushed blast furnace slag or a combination of these.

B. Gravel and crushed gravel shall consist of clean, hard durable particles, free from adherent coating, thin or elongated pieces, soft or disintegrated particles, dirt, organic or deleterious substances, salt or alkali, and other foreign material.

C. Crushed stone shall consist of the clean, dust free product resulting from crushing of stone. There shall be no adherent coatings, clay, loam organic or deleterious substances, salt or alkali, and other foreign material.

D. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the following:

Material removed by decantation	1.00%
Shale, Slate or other similar material	1.00%
Clay lumps	0.25%
Soft fragments	3.00%
Other deleterious substances, including friable, thin, elongated or laminated pieces	3.00%
The sum of all deleterious substances exclusive of material removed by decantation, shall not exceed by weight	5.00%

E. Coarse aggregates shall have a percent wear of not more than 45 when tested in accordance with Test Method Tex-410-A.

F. Gradation, percent of weight retained on:

1. Grade No. 1 - Maximum Nominal Size 2 1/2-inches (63 mm)

Sieve	Percentage Retained
2 1/2-inches	0%
2-inches	0 - 20%
1 1/2-inches	15 - 50%

3/4-inches	60 - 80%
No. 4	95 - 100%

2. Grade No. 2 - Maximum Nominal Size 1 1/2-inches (37.5 mm)

Sieve	Percentage Retained
2-inches	0%
1 1/2-inches	0 - 5%
3/4-inches	30 - 65%
3/8-inches	70 - 90%
No. 4	95 - 100%

3. Grade No. 3 - Maximum Nominal Size 1-inch (25 mm)

Sieve	Percentage Retained
1 1/2-inches	0 - 5%
3/4-inches	10 - 40%
1/2-inches	40 - 75%
No. 4	95 - 100%

4. Grade No. 4 - Maximum Nominal Size 3/8-inch (9.5 mm)

Sieve	Percentage Retained
1/2-inches	0 - 5%
3/8-inches	5 - 30%
No. 4	75 - 100%

G. Gradation Requirements - maximum size of aggregate for structural concrete shall not exceed three inches, and shall be reduced in size to meet the following conditions:

1. One-sixth (1/6) of the least dimension between forms of that part of the structure in which concrete is to be placed.
2. Three-fourths (3/4) of the clear space between reinforcement.
3. The maximum size aggregate is defined as the clear space between the sides of the smallest square openings through which 95 percent of the weight of the aggregate can be passed.
4. Unless otherwise noted or restricted by above Grade No. 2, gradation shall be used.

2.5 PIT-RUN AGGREGATE

A. Pit-run aggregate is the natural gravel and sand obtained from pits without the addition of other fine or coarse aggregates, and shall consist of hard, durable, uncoated pebbles or stone particles mixed with sand.

B. Pit-run aggregate shall be free from lumps of clay and injurious amounts of dust, shale, soft or flaky particles, salt and alkali.

C. Pit-run aggregate shall be well graded from coarse to fine when tested by standard laboratory methods and shall meet the following minimum requirements for percentages by weight:
1. Retained on 1/4 in sieve 55 to 60%

D. Pit-run aggregate shall not be used for high-strength concrete of 3000 psi and above.

E. Pit-run aggregate may be used only for concrete cushion, cradle and protection for pipe.

2.6 ADMIXTURES:

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

Products: Subject to compliance with requirements, provide one of the following:

Catexol 1000CL; Axim Concrete Technologies.
b. MCI 2000 or MCI 2005; Cortec Corporation.
c. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
d. Rheocrete 222+; Master Builders, Inc.
e. FerroGard-901; Sika Corporation.

2.7 REINFORCING STEEL

A. Reinforcing steel shall comply with Section 03200.

2.8 CURING MATERIALS

A. Liquid Membrane: white pigmented chlorinated rubber, ASTI C309.

B. Liquid Membrane: resin base, clear compound, permitting application of paint, Serviced Products Corporation - Code 2802 or equal.

C. Plastic Film: White pigmented, 0.00085-inches (minimum) thick.

D. Burlap: jute fabric, lean, free of impurities.

E. Surface Hardener: gray crystal, acidic fluosilicate base, slightly hygroscopic chemical surface hardener, SIKA Hardener, SIKA Chemical Corporation, or equal.

2.9 JOINT MATERIALS

A. Joint Sealer: hot poured, non-extruding, elastic, ASTI 01190.

B. Preformed Expansion Joint Filler: non-extruding, bituminous fiber, ASTI D1751.

2.10 WATERSTOP

A. Polyvinyl chloride or rubber, centerbulb.

B. Size to suit joinings, minimum 6-inches.

2.11 FORM MATERIALS

A. Use plywood, metal, metal framed plywood faced or other acceptable panel-type material.

B. Coat forms with non-bonding, non-staining commercial compounds.

2.12 MOISTURE BARRIER

A. Polyethylene sheet, minimum 8-mil., ASTI E154.

2.13 CONCRETE MIX DESIGN AND CONTROL

A. Submit not less than 10 days prior to the start of concreting operations to the Engineer:

1. Mix design, using a coarse aggregate factor acceptable to the Engineer.
2. Sufficient samples of all materials to be incorporated into the mix for testing.
3. Full description of the source of supply of each material component.

B. Coarse aggregate factor:

1. Not more than 0.82 when voids less than 48%.
2. Not more than 0.85 when voids exceed 48%.
3. Not less than 0.68.

C. No changes or deviations from proportions or sources of supply without approval of Engineer.

D. No concrete may be placed on the job site until the mix design has been approved by Engineer in writing to the Contractor.

2.14 CONCRETE QUALITY:

A. Consistency:

1. Mortar shall cling to the coarse aggregate.
2. The aggregate shall not segregate during transport.
3. The concrete and mortar shall show no free water when removed from the mixer.

B. The consistency should allow the completion of all finishing operations with the addition of water to the surface.

C. The concrete shall be uniform, workable, cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass.

D. Excessive bleeding shall be avoided.

D. Slump requirements shall be as follows:

Structural Concrete	Average Slump	Maximum Slump
1. Cased Drilled Shafts and Thin-walled Sections (9-inches or less)	4	5
2. Slabs, Caps, Columns, Piers, wall sections over 9-inches.etc.	3	4
3. Slip Form Paving	1/2	2
4. Underwater or Seal Concrete	5	6
5. Rip-rap, Curb, Gutter and other Miscellaneous Surfaces	As Specified By Owner	As Specified By Owner

NOTE: No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements shall be considered unsatisfactory; and the mix shall be changed to correct such unsatisfactory conditions.

F. The concrete shall comply with Table 1 below:

TABLE 1 - CLASSES OF CONCRETE

Class Of Concrete	Minimum Maximum SX Cement Per CY	Minimum Compressive Strength 28-day p.s.i.	Minimum Beam Strength 7-day p.s.i.****	Maximum Water Cement Item 2.1.1(c)(4)	Coarse Aggregate Number
A	5.0	3000	500	6.5	2-3-4
B	4.0	2000	330	8.0	2-3-4
C*	6.0	3600	600	6.0	1-2-3**
D	3.0	1500	250	11.0	2-3-4
E	6.0	3000	500	7.0	2-3
F	6.5	4200	700	5.5	2-3
H***	6.5-8.0	As Spec'd On plans	N/A	5.5	3

*Entrained Air.
**No. 1 coarse aggregate may be used in foundations only (Except cased drilled shafts).
***Prestressed Concrete.
****ASTI C293 (Center Point).

2.15 GROUT:

A. Non-Shrink:

1. Use premixed non-shrink, Embeco Pre-Mixed Grout or Embeco Pre-Mixed Mortar by Master Builders Company or equal.

2. Keep water to a minimum for placing by the dry packing method.

PART 3 - EXECUTION

3.1 SUBGRADE

A. Insure subgrade is true to line and grade and compacted as specified.

B. Fill and recompact any ruts or depressions.

C. Check cross section with a template.

D. Place moisture barrier or motion subgrade prior to placing of concrete. Method to be approved by Engineer.

3.2 FORMS

A. Provide forms for all concrete work including footings and base slabs.

B. Construct forms so that completed concrete will conform to shapes, lines, grades and dimensions indicated and required.

C. Forms shall be true, plumb and level with reasonably tight joints. Adequately support and brace forms.

D. Place anchors, inserts, blots, sleeves and other devices indicated or required for the various portions of all the work.

E. Oil temporary forms with non-staining form oil before reinforcing steel is placed.

F. Rough form finish as defined by ACI 301 permitted for concealed concrete.

G. Smooth form finish as defined by ACI 301 permitted for concealed concrete.

H. Provide 3/4 inch chamfer on exposed corners and edges, and 1-foot below ground level.

3.3 REMOVAL OF FORMS

A. Do not remove forms or supports until concrete has acquired sufficient strength to safely support its own weight and the superimposed loads.

B. Remove formwork for columns, walls, beam sides and other parts not supporting the weight of the concrete as soon as the concrete has hardened sufficiently to resist damage from removal operations.

C. Formwork for slabs, beam soffits and other parts supporting the weight of the concrete shall remain in place until the concrete has reached its specified 28-day strength.

D. Protect concrete from damage prior to acceptance.

E. Prohibit traffic until concrete is at least 10 days old.

F. Cure areas previously covered by forms.

3.4 MIXING CONCRETE

A. Maintain all equipment, tools, and machinery used for hauling materials and performing any part of the work to insure completion of the work underway without excessive delays for repairs or replacement.

B. Mixing shall be done in a mixer of adequate size and type to produce uniform distribution of the material throughout the mass.

C. The mixer shall have a plate affixed showing the manufacturer's recommended operating data and it shall be operated within the speed and capacity limits stated thereon.

D. The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.

E. The entire contents of the drum shall be discharged before any materials are placed.

F. Improperly mixed concrete will not be placed.

G. The mixing time shall be in accordance with the recommendations of the mixer manufacturer.

H. Transit Mix Concrete:

1. Sufficient transit mix equipment shall be assigned exclusively to the project as required for continuous operation.
2. Satisfactory evidence shall be furnished so that the delivery of concrete shall be continuous at regular and uniform intervals, without stoppage or interruption.
3. Concrete shall not be placed on the job after a period of 1 hour after the cement has been placed in the mixer, with mixer turning; 30 minutes without turning.

H. Continuous Volumetric Mix Concrete:

1. A mobile, continuous, volumetric mixer of the rotating puddle type may be used for when approved by Engineer.
2. Mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mix them to the required consistency before discharging.
3. The mixers shall have adequate water supply and metering devices.
4. Calibration of these mixers will be required.

3.5 PLACING CONCRETE

A. The minimum temperature of all concrete at the time of placement shall not be less than 50°F.

B. Clean transporting equipment, reinforcing and embedded items before placing concrete.

C. Batch trucks or paving equipment not permitted on prepared subgrade unless authorized by the Engineer based on actual job conditions.

D. Place no concrete until after inspection of forms by Engineer.

E. The maximum time interval between the addition of cement to the batch, and the placing of concrete in the forms shall not exceed the following:

Air of Concrete Temperature	NonAgitated Concrete	Maximum Time
80ºF or Above 35ºF to 79ºF	26.6ºC 1.6ºC to 26.1ºC	15 minutes 30 minutes
Air of Concrete Temperature	Agitated Concrete	Maximum Time
90ºF and Above 75ºF to 89ºF 35ºF to 74ºF	32.2ºC 23.9ºC to 31.6ºC 1.6ºC to 23.3ºC	45 minutes 60 minutes 90 minutes

F. Prevent segregation during placing.

G. Consolidate flat work with one pass of a mechanical vibrator moving parallel to the centerline. Unusual sections and widths may be hand puddled and finished.

H. Place concrete continuously so that each pour unit will be monolithic in construction and will terminate at an expansion, contraction or construction joint. Permit no more that 30 minutes between depositing adjacent batches.

I. Place slab concrete over membrane waterproofing before waterproofing has become damaged or dirty.

J. Concrete placement will not be permitted when impending weather conditions will impair the quality of the work.

K. Slope horizontal surfaces of exterior concrete for drainage.

L. Deposit concrete in forms in horizontal layers not deeper than 24 inches. . Avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.

M. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

N. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to penetrate placed layer of concrete and at least 6-inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. Limit vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

3.6 PLACING CONCRETE IN WATER

A. Concrete shall be deposited in water only when specified on the plans or with written permission of the Engineer.

B. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is deposited.

C. Water pumping will not be permitted during the concrete placing, nor until it has set for at least 36 hours.

D. The concrete shall be placed with a tremie, closed bottom-dump bucket or other approved method.

E. The concrete shall not be allowed to fall freely through the water nor shall it be disturbed after it has been placed. Its surface shall be kept approximately level during placement.

F. The tremie shall consist of a water-tight tube 14-inches or less in diameter. It shall be constructed so that the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow. The lower end of the tremie shall be submerged in the concrete at all times.

G. Bottom-dump buckets used for underwater placing shall have a capacity of not less than one-half cubic yard. It shall be lowered gradually and carefully until it rests upon the concrete already placed and raised very slowly during the upward travel; the intent being to maintain still water at the point of discharge and to avoid agitating the mixture.

H. The placing operations shall be continuous until the work is complete.

I. Unless otherwise specified, all concrete placed under water, except seal concrete, shall contain an additional sack of cement per cubic yard.

3.7 JOINTS

A. Contraction Joints:

1. Extend entirely across flat slabs at locations shown.
2. Location where not shown; maximum spacing is:
   a. Driveways: 10-feet.
   b. Sidewalks: 4-feet.
   c. Other flat slabs: 20 times slab thickness.
3. Saw depth not less than 1/4 slab thickness.

B. Expansion Joints:

1. Install where shown on the plans.
2. Locations where not shown: all structures and features which project through, into or against slab.
3. Install according to manufacturer's recommendations, set material securely before placing concrete.
4. Install 1-inch width unless shown otherwise.

C. Filling Joints:

1. Fill not later than 14 days after sawing.
2. Fill immediately following cleaning.
3. Fill to 1/8-inch of surface.
4. Remove excess while material is still pliable.
5. Refill low areas where necessary.
6. Omit filling sidewalk joints.

3.8 FINISHING EXTERIOR FLAT WORK

A. Strike off and float as required.

B. Check surface with ten foot straight edge, maximum variance allowed -1.8-inch.

C. Drag concrete surface longitudinally with double thickness burlap drag after completion of straight edging unless noted otherwise.

D. Use edger on edges of slab.

E. Use hand finishing only when approved by Engineer.

3.9 FINISHING OTHER CONCRETE

A. Interior floors: smooth, steel-troweled finish; use edger on exposed edges. Grind smooth defects which would telegraph through applied finish flooring.

B. Exterior walks and steps lightly broomed finish transverse to traffic flow; use edger on exposed edges.

C. Other surfaces:

1. Remove fins, projections and loose material.
2. Clean surfaces of form oil.
3. Patch honeycomb, aggregate pockets, voids and holes as follows:
   a. Chip out until sound concrete is exposed to minimum depth of 1-inch.
   b. Prepare patching mortar with approximately two parts of normal Portland Cement, one part white cement, nine parts fine aggregate; vary proportions of aggregate as necessary to match color of adjacent concrete.
4. Fill holes left by form ties to within 1-inch of surface with non-shrink grout. Fill remainder with patching mortar specified hereinbefore.
5. Apply grout-cleaned finish to all exposed vertical surfaces. Wet surface and rub grout on surfaces with rubber or cork float. Scrape off excess grout and finish with brick rubbing or as approved by Engineer.

E. Coordinate required finish with Engineer.

3.10 CURING

A. Contractor shall inform the Engineer fully of the methods and procedures proposed for curing; shall provide proper equipment and in adequate amounts; and shall have approval of the proposed method, equipment and materials prior to placing concrete.

B. All concrete shall be cured for a period of 4 curing days except as noted herein.

1. Exceptions to 4-day Curing.
   a. Upper surfaces of Bridge Roadway, Median and Sidewalk Slabs and Top Slabs of Direct Traffic Culverts require 8 curing days.
   b. A curing day is defined as a calendar day when the ambient temperature, taken in the shade away from artificial heat, is above 50° Fahrenheit (10°C) for at least 19 hours, or the ambient temperature is 50° or less; and if satisfactory provisions are made to maintain the temperature at all surfaces of the concrete above 40° Fahrenheit (4.4°C) for the entire 24 hours.

C. Form Curing:

1. When forms are left in contact with the concrete, other curing methods shall not be required except for cold-weather protection.

D. Water Curing:

1. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet requirements for concrete mixing water.

   a. Wet Mat:

      (1) Cotton mats shall be used for this curing method. The mats shall not be placed in contact with the concrete until such time that damage shall not occur to the surfaces.
      (2) Damp burlap blankets made from 9-ounce stock may be placed upon the damp concrete surface for temporary protection prior to the application of the cotton mats.
      (3) The mats may be placed by and wetted down after placement.
      (4) Mat curing, except for continuous placements, shall commence not later than three hours after finishing of the roadway slab.
      (5) The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible.
      (6) The surfaces of the concrete shall be kept wet for the required curing time.
      (7) Surfaces which cannot be cured by contact shall be enclosed with mats, anchored positively to the forms, or to the ground, so that outside air cannot enter the enclosure. Sufficient moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet.

   b. Water spray:

      (1) This method shall be accomplished by overlapping sprays or sprinklers, so that all unformed surfaces are kept continuously wet.

   c. Ponding:

      (1) This method requires the covering of the surface with a minimum of two inches (5 cm) of clean granular material, kept wet at all times; or water to a minimum depth of one

inch (2.5 cm). Satisfactory provisions shall be made to provide a dam to retain the granular material or water.

E. Membrane Curing

1. Unless otherwise shown on the plans, Type 2 membrane curing compound may be used where permitted.
2. Membrane shall be applied in a single, uniform coating at the rate of coverage recommended by the manufacturer and as approved by the Engineer, but not less than nine gallons per 210 feet (.0038M^3 63M) of area. Tests for acceptance shall be at this specified rate.
3. Membrane curing shall not be applied to dry surfaces; but shall be applied to horizontal surfaces just before free moisture has disappeared.
4. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane.
5. When a membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. A membrane which is damaged shall be corrected immediately by reapplication of membrane.

	REQUIRED		PERMITTED	
	Water for Complete Curing	Membrane for Interim Curing	Water for Complete Curing	Membrane for for Interim Curing
A. Upper surfaces of Bridge Roadway, Median and Sidewalk Slabs, Top Slabs of Direct Traffic Culverts	X	X (Resin Base)		
B. Top Surface of any Concrete Unit upon which Concrete is to be placed and bonded at a later interval (Stub Walls, Risers, etc.) Other Super structure Concrete (Curbs, Wingwalls, Parapets walls, etc.)	X			
C. Top surface of precast and/or prestressed piling	X	X		
D. All substructure Concrete, Culverts, Box Sewers, Inlets, Manholes, Retaining walls, Riprap.			X	X

*Polyethylene sheeting or burlap polyethylene mats fastened to prevent outside air from entering shall be considered equivalent to water or membrane curing per this item.

3.11 TESTING

A. Furnish at least three cylinders or beams from each 40 cubic yard, or portion thereof for test purposes

unless otherwise directed by Engineer. Test one cylinder at 7 days, test second cylinder at 28 days and test third cylinder only if needed for confirmation of compression strength.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling-in: fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Use non-shrink grout as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Equipment bases and foundations: provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment. Use non-shrink grout as shown on plans.

C. Steel pan stairs: provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screen, tamp and finish concrete surfaces as scheduled.

D. Reinforced masonry; provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

END OF SECTION 323000

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SECTION 331313 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 321313, Concrete Pavement.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
2. ASTM A615, Specification for Deformed Billet Steel Bars for concrete.
3. ASTM A185, Specifications for Welded Steel Wire Fabric for Concrete Reinforcement.
4. Concrete Reinforcing Steel Institute, Manual of Standard Practice.

B. Allowable Tolerances:

1. Fabricating: (per ACI 117-90)
   a. Saw cut length to: Plus or minus 1". (Remove all burrs).
   b. Stirrups and ties: Plus or minus 1/2".
   c. All other bends: Plus or minus 1".
2. Placing:
   a. Concrete cover to formed surfaces: Plus or minus 1/4".
   b. Minimum spacing between bars: Plus or minus 1/4".
   c. Top bars in slabs and beams:
      (1) Members 8" deep or less: Plus or minus 1/4".
      (2) Members more than 8" but not over 2'-0" deep: Plus or minus 1/2".
      (3) Members more than 2'-0" deep: Plus or minus 1".
      (4) Crosswise of members: Space evenly within 2" of stated separation.
      (5) Lengthwise of members: Plus or minus 2".
3. Maximum bar relocation to avoid interference with other reinforcing steel, conduits, or other embedded item: 1 bar diameter.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with tags indicating bar size, length and mark.

B. Unload reinforcing carefully to prevent damage. Store above ground in dry, well drained area; protect from mud, dirt and corrosion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: ASTM A615, deformed billet steel bars, domestic manufacture, Grades 40 and/or 60 as indicated on structural drawings.

B. Welded Wire Fabric Reinforcing: ASTM A185, steel wire spot welded at intersections and of size indicated.

C. Metal Accessories: Include spacers, chairs, bolsters, ties and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place, conforming to requirements to CRSI "Manual of Standard practice for Detailing Reinforced Concrete Structures." Metal accessories shall be galvanized or plastic coated where legs will be exposed in finished concrete surfaces.

D. Tie Wire: FS QQ-W-461, black annealed steel, 16 ga. min.

2.2 FABRICATION:

A. In accordance with CRSI "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Cleaning: Before placing in work, thoroughly clean reinforcement of loose rust, mill, scale, dirt, oil, and other coating which might tend to reduce bonding. Reinspect reinforcing left protruding for future bonding, or following delay in work, and reclean if necessary.

3.2 INSTALLATION

A. Bar Placement: In accordance with CRSI "Recommended Practice for Placing Reinforcing Bars" and "Recommended Practice for Placing Bar Supports."

1. Bending: Bend bars cold; do not heat reinforcing or bend by make-shift methods. Discard bent, kinked or otherwise damaged bars.
2. Splices: In accordance with ACI 315.
3. Placing: Accurately position reinforcement; securely saddle tie at intersections.
4. Supports: In accordance with ACI 315 for number, type, spacing and placing.

END OF SECTION 331313

SECTION 334000 - STORM SEWAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Material and installation of storm sewer culverts and appurtenances, including headwalls.

1.2 RELATED SECTIONS:

A. Trenching, Excavation, Backfill, and Compaction Section 312200.

B. Cast-in-place concrete - Section 323000.

1.3 REFERENCES:

A. ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

B. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

C. ASTM A377- Ductile Iron Pipe

D. Texas Department of Transportation (TxDOT) Most Recent Edition Standard Specifications for Construction of Highways, Streets and Bridges.

1.4 SUBMITTALS:

A. Procedures for Submittals: Section 013300.

B. Pipe Certification: Manufacturer's certification that pipe meets the requirements of these specifications.

PART 2 - PRODUCTS

2.1 STORM SEWER PIPE:

A. Reinforced Concrete Pipe: Provide reinforced concrete pipe which conforms with ASTM C76, class as shown on the Drawings.

B. Schedule 40 PVC and Schedule 80 PVC Pipe Culverts: Provide Schedule 40 PVC or Schedule 80 PVC pipe fabricated in conformance with ASTM D1784.

C. Class 52 Ductile Iron Pipe for storm sewerage. (See section 02665 Water Systems)

2.2 CONCRETE PIPE JOINT MATERIAL:

A. Cold Compound Joints: For concrete pipe sections carrying rainfall runoff, furnish pipe joint material (Talcote No. 0.52, Gulf States No. GS 702, or Ram-Nek flexible plastic

gasket manufactured by the K. T. Snyder Company, Inc.) meeting the requirements of the SDHPT Standard Specification for Construction of Highways, Streets and Bridges, Item 464.2 paragraph 13b and 13d. Apply a primer of the type recommended by the manufacturer of the compound used.

PART 3 - EXECUTION

3.1 EXCAVATION, BACKFILLING AND COMPACTION:

A. Excavation, backfill, and compaction of the trench shall be in accordance with Section 312100.

3.2 PIPE INSTALLATION:

A. Pipe Sewers and Culverts: Do not place pipe until the excavation has been completed, the bottom of the trench shaped, proper bedding material placed, and the line and grade have been obtained. Lay pipe accurately to line and grade in a straight line with spigot or tongue end of the pipe pointing in the direction of flow. Fit pipes together and match them so that when laid, the pipe will form a sewer or culvert with a smooth and uniform invert except where there is a pipe size change, in which case, the crowns of the larger and smaller pipes shall be at the same elevation and a concrete collar used to make the connection, unless otherwise shown.

B. PVC culvert pipe joints shall be solvent welded with appropriate solvent weld compound as recommended by the PVC pipe manufacturer.

3.3 CONCRETE PIPE CULVERT JOINT INSTALLATION:

A. Cold Compound Joints:
   1. Tongue and Groove Pipe. Completely coat both ends of the pipe with primer on all surfaces that will be in contact. Coat pipe only when the pipe is clean and dry. Allow the primer to dry before the pipe is laid. Pipe 24 inches and larger must be primed at the factory. After pipe has been set to proper line and grade in the trench, trowel or otherwise apply to the groove end of the pipe a 1/2-inch-thick layer of compound. Cover two-thirds of the joint face around the entire circumference. Next, shove home the tongue end of the next pipe with sufficient pressure to make a tight joint. Take care to avoid leaving ridges of compound projecting into the pipe. Make necessary adjustments in the quality and consistency of the compound, as directed by the Owner.
   2. Positioning. Joints made with cold compound may be pulled home by means of a suitable winch or other suitable power equipment or a come-along. Do not use a bar stuck into the ground for positioning joints on pipe larger than 10 inches. A bar may be used to push home the joints in pipe 10 inches and smaller, provided the joints are pushed all the way home. Positioning joints multiplied by the laying length per joint must equal the actual length of sewer in any given section. Pull pipe home in a straight line with all parts of the pipe on line and grade. Do not permit horizontal or vertical movement of the pipe during or after the pulling operation. Pull or push home rubber gasket joints by any suitable means that will provide adequate pressure to ensure proper assembly of the joint. Use special care to ensure that the joints are positioned in accordance with the published instructions of the manufacturer. Do not mortar the outside of joints. Do not use backhoe to drive pipe to make-up pipe joints.

3.4 HEADWALL, MANHOLE AND INLET INSTALLATION:

A. Construct all headwalls to line and grade and at locations shown. Construct in accordance with Section 323000, Cast-in-Place Concrete, and as required in TxDOT Most Recent Edition Standard Specifications for Construction of Highways, Streets, and Bridges. Neatly cut off all pipe leads at the appropriate face of the headwall, manhole or inlet wall and finish with mortar.

END OF SECTION 334000

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EXHIBIT A-5

to

November 17, 2020 GMP Amendment

to

Agreement dated March 26, 2019 between
Hidalgo County and E-Con Group, LLC
Sunset Park Operations Facility (Precinct No. 1)

Drawings Issued By Alvarado Architects and Halff Associates
(See attached pages)

HIDALGO COUNTY, PCT. 1

SUNSET PARK OPERATIONS FACILITY

COUNTY OF HIDALGO, CITY OF MERCEDES, TX

RFP# 2018-18-11

Hidalgo County Commissioners

Richard F. Cortez, Judge

David L. Fuentes	Commissioner Dist. 1	Joe M. Flores	Commissioner Dist. 3
Edward "Eddie" Cantu	Commissioner Dist. 2	Ellie Torres	Commissioner Dist. 4

Architect
Alvarado Architects & Associates, Inc.
307 South Main St.
Donna, Texas 78537
[P] 956.464.8258
[F] 956.464.8268

Project Manager
B2Z Engineering
900 S. Stewart Rd.
Mission, TX 78572
[P] 956-585-3773

MEP Engineering
HALFF Engineering
5000 W. Military HWY, Suite 100
McAllen, TX 78503
[P] 956-664-0286
[F] 956-664-0282

Civil Engineering
HALFF Engineering
5000 W. Military HWY, Suite 100
McAllen, Texas 78503
[P] 956-664-0286
[F] 956-664-0282

Structural Engineering
Chanin Engineering
McAllen, TX 78501
[P] 956-332-3206
[F] 956-687-5561

100% CD's - FOR CONSTRUCTION

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/20

DRAWING TITLE:
COVER SHEET

FILE NAME:

JOB NO.: 1718

DATE: 11/06/2020

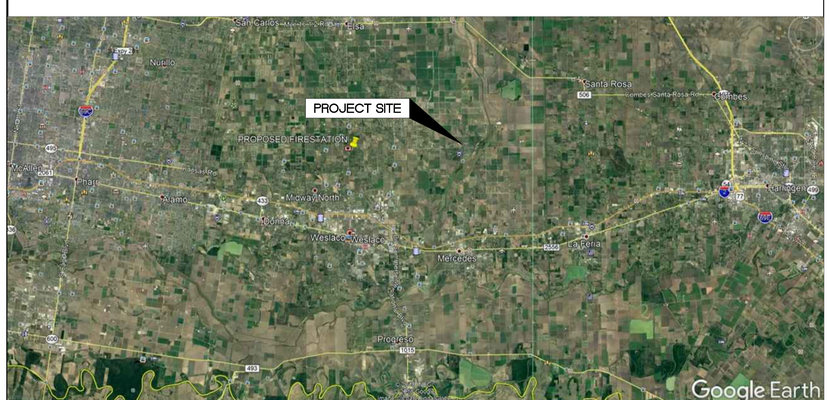
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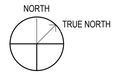
A/C	AIR CONDITIONING
ACP.	ACOUSTICAL PANEL
ACT.	ACOUSTICAL TILE
A.D.	AREA DRAIN
A.D.A.	AMERICANS WITH DISABILITIES ACT
ADJ.	ADJUSTABLE
A.F.F.	ABOVE FINISH FLOOR
A.F.G.	ABOVE FINISH GRADE
A.H.J.	ATHORITY HAVING JURISDICTION
ALUM	ALUMINUM
ALT.	ALTERNATE
∟	ANGLE
ASPH.	ASPHALT
BD.	BOARD
BLDG.	BUILDING
BLK.	BLOCK
BM.	BEAM
B.U.R.	BUILT-UP ROOF
C	CHANNEL
CAB, CABT	CABINET
CFMF	COLD FORMED METAL FRAMING
C.J.	CONTROL JOINT
CL.	CENTER LINE
CLG.	CEILING
C.M.U.	CONCRETE MASONRY UNIT
COL.	COLUMN
COMP.	COMPRESSIBLE
CONC.	CONCRETE
COND.	CONDITION
CONT.	CONTINUOUS
CORR.	CORRIDOR
CPT.	CARPET
CT.	CERAMIC TILE
CTSK.	COUNTERSINK
C.W.	COLD WATER
D	DRYER
D.F.	DRINKING FOUNTAIN
DIA.	DIAMETER
DIM.	DIMENSION
D.P.	DAMPPROOFING
DTL	DETAIL
D.S.	DOWN SPOUT
DWG.	DRAWING
EA.	EACH
EDF	ELECTRIC DRINKING FOUNTAIN
EL.	ELEVATION (HEIGHT)
ELECT.	ELECTRICAL
ELEV.	ELEVATION (DRAWING)
E.J.	EXPANSION JOINT
EQ.	EQUAL
EQUIP	EQUIPMENT
EXIST.	EXISTING
EXP.	EXPANSION
EXT.	EXTERIOR
FB.	FACE BRICK
FD.	FLOOR DRAIN
F.E.	FIRE EXTINGUISHER
F.E.C.	FIRE EXTINGUISHER CABINET
F.H.C.	FIRE HOSE CABINET
FIN.	FINISH
FIXT.	FIXTURE
FLR.	FLOOR
FLSHG.	FLASHING
FLUOR	FLUORESCENT
F.R.P.	FIBERGLASS REINFORCED PANEL
GA.	GAUGE
GALV.	GALVANIZED
G.B.	GRAB BAR
CMBU	GLAZED CONCRETE MASONRY UNIT
GEN.	GENERAL
G.I.	GALVANIZED IRON
GL.	GLASS
GR.	GRADE
GTP.	GLAZED TILE PAVER
GYP.	GYPSUM
HC	HANDICAPPED ACCESSIBLE
HT.	HEIGHT
HORIZ	HORIZONTAL
HM	HOLLOW METAL FRAME
H.W.	HOT WATER
I.D.	INSIDE DIAMETER
INSUL	INSULATION
INT.	INTERIOR
I.P.S.	IRON PIPE SIZE
JT.	JOINT
LAM.	LAMINATE
LAV.	LAVATORY
L.P.	LIGHT POLE
LT.	LIGHT
LT. WT.	LIGHT WEIGHT
MFR.	MANUFACTURER
MAS.	MASONRY
MATL.	MATERIAL
MAX.	MAXIMUM
MB.	MARKER BOARD
MECH.	MECHANICAL
MEM.	MEMBRANE
MEM. WP.	MEMBRANE WATERPROOFING
MEP	MECHANICAL, ELECTRICAL AND PLUMBING
MEZZ.	MEZZANINE
M.H.	MAN HOLE
MIN.	MINIMUM
MISC.	MISCELLANEOUS
M.O.	MASONRY OPENING
MOD.	MODULE
M.R.	MOISTURE RESISTANT
MTL.	METAL
MTP.	METAL TOILET PARTITION
N.D.	NAPKIN DISPOSAL
N.I.C.	NOT IN CONTRACT
NO.	NUMBER
N.T.S.	NOT TO SCALE
N.V.	NAPKIN VENDOR
O.C.	ON CENTER
O.C.E.W.	ON CENTER EACH WAY
O.D.	OUTSIDE DIAMETER
O.F.C.I.	OWNER FURNISHED, CONTRACTOR INSTALLED
O.H.	OPPOSITE HAND
OPNG.	OPENING
OPP.	OPPOSITE
P.C.	PRECAST
P.H.	PAPER HOLDER
PL.	PLATE
P.L.	PROPERTY LINE
P. LAM.	PLASTIC LAMINATE
PLUMB.	PLUMBING
PLWD.	PLYWOOD
POL.	POLISHED
P.P.	POWER POLE
PR.	PAIR
PREFIN.	PREFINISHED
PT.	POINT
PTD.	PAINTED
P.W.B.	PREFINISHED WALL BOARD
QT.	QUARRY TILE
R	RADIUS
RD.	ROOF DRAIN
RE., REF.	REFERENCE
RECP.	RECEPTACLE
REINF.	REINFORCE
RES.	RESILIENT
REQ'D.	REQUIRED
REV.	REVISION, REVISED
RF	RECREATIONAL RESILIENT FLOORING
RPG.	RELOCATABLE PAINTED GYPSUM BOARD
RSS.	ROD STOCK AND SEALANT
S.C.	SEALED CONCRETE
SCHED.	SCHEDULE(D)
SCPL	SOLID CORE PLASTIC LAMINATE
S.D.	SOAP DISPENSER
SEC.	SECTION
SHT.	SHEET
SIM.	SIMILAR
SPC.	SPECIAL COATING SYSTEM
SPECS.	SPECIFICATIONS
SQ.	SQUARE
SS.	SOUND STRIP
S.S., ST.	STAINLESS
STL.	STEEL
STRUCT.	STRUCTURAL
SUSP.	SUSPENDED
SVF	SHEET VINYL FLOORING
SVDF	SHEET VINYL DANCE FLOORING
T.A.S.	TEXAS ACCESSIBLITY STANDARDS
T.B.	TACK BOARD
T.D.R.	TOWEL DISPENSER AND RECEPTACLE
TEL	TELEPHONE
TERR.	TERRAZZO
THK.	THICK
T.O.	TOP OF
T.O.B.	TOP OF (WOOD) BLOCKING
T.O.M.	TOP OF MASONRY
T.O.S.	TOP OF STEEL
T.T.D.	TOILET TISSUE DISPENSER
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
UR.	URINAL
V	VENT
V.C.T.	VINYL COMPOSITE TILE
VENT.	VENTILATING, VENTILATED
VER.	VERIFY
VERT.	VERTICAL
VGB	(PREFINISHED) VINYL CLAD GYPSUM BOARD
V.I.F.	VERIFY IN FIELD
VWC	VINYL WALL COVERING
W	WASHING MACHINE
W/	WITH
W.C.	WATER CLOSET
WD.	WOOD
WDW.	WINDOW
W.P.	WATERPROOFING
W.S.	WEATHERSTRIP
WT.	WEIGHT
W.W.	WATER
W.W.F.	WELDED WIRE FABRIC



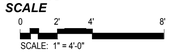
Area Map of Mercedes Sunset Park, Mercedes TX

Symbols Legend

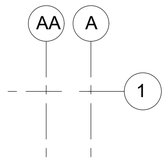
NORTH ARROW



GRAPHIC SCALE



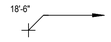
COLUMN SYMBOL &



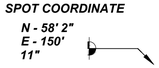
VERTICAL ELEVATION



SPOT ELEVATION



SPOT COORDINATE



MATCH LINE



PROPERTY LINE

FENCING (WITH POSTS)



BREAK LINE



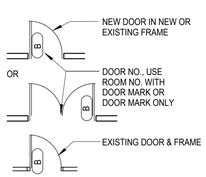
KEY NOTE



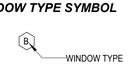
ROOM NAME AND NUMBER



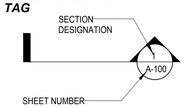
DOOR NUMBER



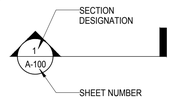
WINDOW TYPE SYMBOL



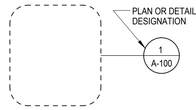
BUILDING SECTION TAG



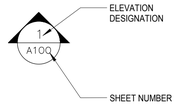
DETAIL/WALL SECTION TAG



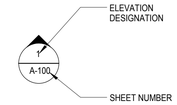
PARTIAL PLAN AND DETAIL TAG



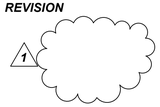
EXTERIOR ELEVATION TAG



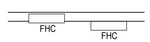
INTERIOR ELEVATION TAG



DRAWING REVISION



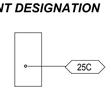
FIRE HOSE CABINET
(RECESSED AND SURFACE MOUNTED)



FIRE EXTINGUISHER CABINET
(RECESSED AND SURFACE MOUNTED)

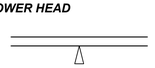


EQUIPMENT DESIGNATION



TOILET ACCESSORY SYMBOL

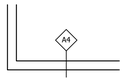
SHOWER HEAD



FLOOR SINK



PARTITION TAG

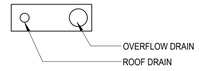


EXISTING PARTITION

NEW PARTITION

FLOOR DRAIN

OVERFLOW DRAIN AND ROOF DRAIN



ROOF TOP UNIT
REFER TO MECHANICAL FOR TYPE



Material Conventions

02 SITE CONSTRUCTION



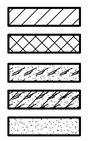
EARTH (existing)
EARTH (backfill)
DRAINAGE FILL

03 CONCRETE



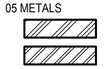
CAST-IN-PLACE CONCRETE
PRECAST CONCRETE

04 MASONRY



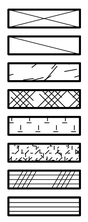
BRICK
CONCRETE MASONRY UNITS
STONE
CAST STONE
GROUT

05 METALS



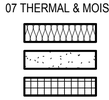
ALUMINUM
STEEL

06 WOODS AND PLASTICS



CONTINUOUS WOOD
INTERMITTENT WOOD
FINISH WOOD
HARDBOARD
MEDIUM DENSITY FIBER BOARD (MDF)
PARTICLE BOARD
PLYWOOD
SOLID SURFACE MATERIAL

07 THERMAL & MOISTURE PROTECTION



BATT INSULATION
LOOSE FILL INSULATION
RIGID INSULATION

08 GLAZING



GLASS

09 FINISHES



LATH AND PLASTER
GYPSUM BOARD

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G0.02 CODE INFORMATION
G0.03 SURVEY (INFORMATIONAL PURPOSES ONLY)
AS1.00 ARCHITECTURAL SITE PLAN
AS1.01 SITE DETAILS
AS1.02 SITE DETAILS

CIVIL

C1.00 GENERAL NOTES
C2.0 DEMOLITION PLAN
C3.0 PAVING AND DIMENSIONAL CONTROL PLAN
C4.0 GRADING PLAN
C5.0 UTILITY PLAN
C6.0 SUGGESTED EROSION CONTROL PLAN
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S502 DETAILS
S601 DETAILS

ARCHITECTURAL

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A3.00 ROOF PLAN
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ED101 ELECTRICL DEMOLITION SITE PLAN
E101 ELECTRICAL LIGHTING SITE PLAN
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TN101 EXISTING TELECOM. SITE PLAN
TN102 NEW TELECOM. SITE PLAN
TN201 TELECOM. PLAN
TN301 TELECOM. DETAILS
FA001 FIRE ALARM GENERAL LEGEND
FA201 FIRE ALARM PLAN
TY001 SECURITY SYSTEMS GENERAL LEGEND
TY101 SECURITY SITE PLAN
TY201 SECURITY PLAN
TY301 SECURITY DETAILS

Code Info

GENERAL INFORMATION

LOCATION: *Mercedes, TX*
ARCHITECT: *Alvarado Architects & Associates, Inc. 307 South Main St. Donna, Texas 78537*
AGENCY INFORMATION: *City of Mercedes*
REASON FOR SUBMITTAL: *New Construction*
RESPONDING FIRE DEPARTMENT: *City of Mercedes Fire Department*
AUTHORITIES HAVING JURISDICTION: -

A. PROJECT DESCRIPTION

This project consists of the construction of new offices with load bearing masonry walls and a pre-engineered metal building with a three bay service garage.

B. APPLICABLE CODES

2015 - INTERNATIONAL BUILDING CODE
2015 - INTERNATIONAL MECHANICAL CODE
2015 - INTERNATIONAL PLUMBING CODE
2008 - NATIONAL ELECTRIC CODE
2012 - INTERNATIONAL FIRE CODE
2015 - NFPA 101 LIFE SAFETY CODE
FM GLOBAL STANDARDS FOR FIRE PROTECTION
2015 - INTERNATIONAL ENERGY CONSERVATION CODE
COMMUNICATIONS: TIA/EIA STANDARDS
TEXAS ACCESSIBILITY STANDARD

100% CD's - FOR CONSTRUCTION

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE. STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/20

DRAWING TITLE: INDEX OF DRAWINGS, MAP, CONVENTIONS & CODE INFO

FILE NAME:

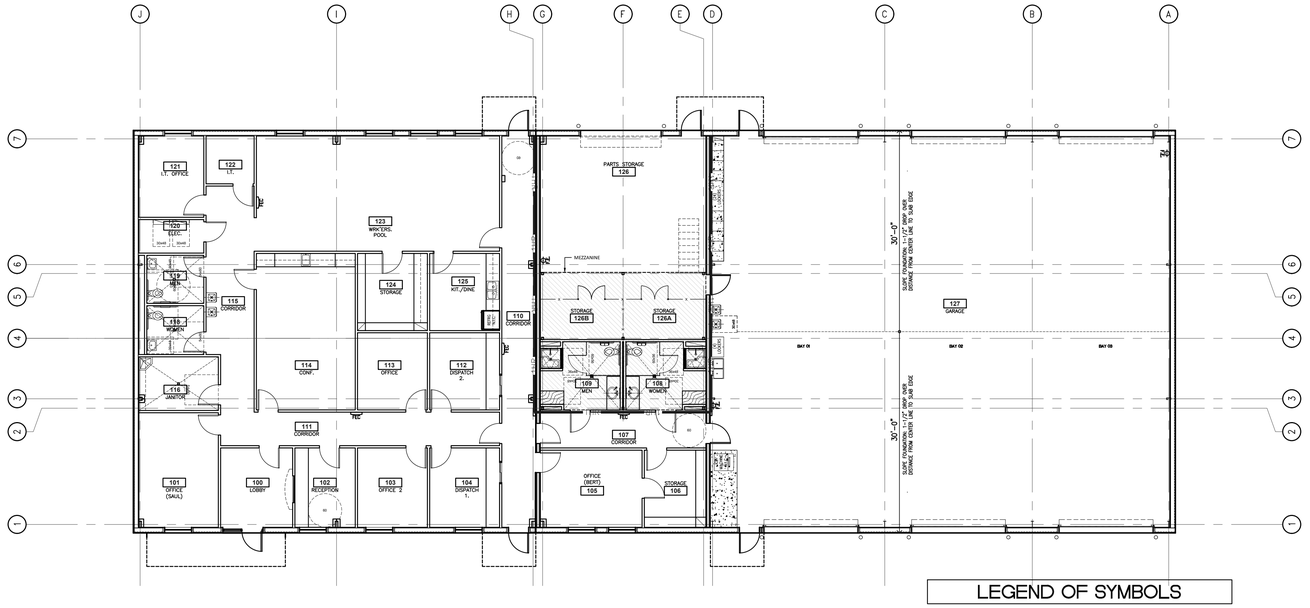
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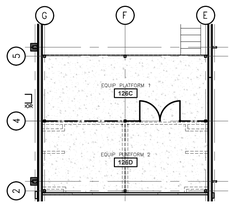
DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: G0.01





LEGEND OF SYMBOLS

F.E. — 10 LB. FIRE EXTINGUISHER BRACKET MOUNTED

FEC — 10 LB. FIRE EXTINGUISHER + CABINET

EXIT LIGHT SIGNAGE

ONE HOUR RATED FIRE BARRIER
UL – U425

NOTES – REFER TO SPECIFICATIONS FOR MORE INFORMATION.

1. REFER TO WALL PARTITION TYPES ON SHEETS A7.04, A7.05, A7.06, A7.07 AND A7.08.
2. PROTECT ALL CONDUIT, PIPES, DUCTS, AND MISC PENETRATIONS THROUGH RATED WALLS, FLOOR OR ROOF WITH FIRE SAFING INSULATION AND FIRE STOP SEALANT. REFER TO UL GUIDELINES FOR APPROPRIATE ASSEMBLIES.
3. UL ASSEMBLIES INDICATED ESTABLISH A BASIS PERFORMANCE. OTHER ASSEMBLIES MAY BE CONSIDERED AT THE DISCRETION OF THE ARCHITECT IF EQUIVALENT PERFORMANCE IS PROVIDED. SUBSTITUTION PROPOSALS SHALL INCLUDE CHANGES REQUIRED TO ALL COMPONENTS OF THE ASSEMBLY.
4. BUILDING TO BE EQUIPPED WITH MANUAL FIRE ALARM SYSTEM + OCCUPANT NOTIFICATION PER NFPA 72.
5. REFER TO SHEET FA201 FOR FIRE ALARM PLAN.

0 4' 8' 16' 24'
SCALE: 1/8" = 1'-0"

N — PLAN NORTH
N — TRUE NORTH

5 LIFE SAFETY + CONSTRUCTION TYPE PLAN
Scale: N.T.S.

GENERAL INFORMATION

LOCATION:	*Mercedes, TX*	AGENCY INFORMATION:	*Hidalgo County*	RESPONDING FIRE DEPARTMENT:	*City of Mercedes Fire Department*
				AUTHORITIES HAVING JURISDICTION:	*Hidalgo County*
ARCHITECT:	*Alvarado Architects & Associates, Inc. 307 South Main St. Donna, Texas 78537*	REASON FOR SUBMITTAL:	*New Construction*	WATER SERVICE:	-.

A. PROJECT DESCRIPTION

THIS 9,360 S.F. BUILDING PROJECT CONSISTS OF NEW CONSTRUCTION CONTAINING OFFICES AND A (3) BAY SERVICE GARAGE . THE FOUNDATION IS A CONCRETE SLAB ON GRADE WITH A COMBINATION OF LOAD BEARING MASONRY WALLS AND A PRE-ENGINEERED METAL FRAME FOR THE STRUCTURE.

B. APPLICABLE CODES

2006 - INTERNATIONAL BUILDING CODE
2006 - INTERNATIONAL MECHANICAL CODE
2006 - INTERNATIONAL PLUMBING CODE
2006 - NATIONAL ELECTRIC CODE
2006 - INTERNATIONAL FIRE CODE
2006 - NFPA 101 LIFE SAFETY CODE
FM GLOBAL STANDARDS FOR FIRE PROTECTION
2006 - INTERNATIONAL ENERGY CONSERVATION CODE
COMMUNICATIONS: TIA/EIA STANDARDS
TEXAS ACCESSIBILITY STANDARD

C. BUILDING HEIGHTS AND AREAS

Construction Type: A.) ADMIN. = TYPE iii B.) GARAGE = TYPE i

Basic Allowable Area

Standard Allowable Square Footage (Table 503 IBC)
Total Allowable Area = A.) ADMIN = 19,000 SF
B.) GARAGE = 48,000 SF

Basic Allowable Height:
Allowable Stories: UL (Table 503)
Actual Stories: 1
Allowable Height: 5 STORIES/4
Actual Height: 25 FT

D. BUILDING OCCUPANCY

A.) ADMIN = BUSINESS GROUP B
B.) GARAGE = MODERATE-HAZARD GROUP F-1

E. OCCUPANCY LOAD AND EXIT REQUIREMENTS (T.10041.1)

Bldg: A-Admin
Occupant Load (ref. sec. table 1004.1.1)
3,680 sq. ft. / 100 sq. ft. net/occupant = **30**
Egress width req.
30 / 2 = 15 X .2 = 3" (ref. sec. table 1005.1)
**** Egress width provided = (3) @ 36"***
**** Stairs: 3-Locations x .3"/ occupancy x 30 = 9"***
****Egress Provided = 2 @ 5' = 10'***

B. Garage
Occupant Load (ref. sec. table 1004.1.1)
7,414 sq. ft. / 500 sq. ft. net/occupant = **15**
Egress width req.
(15 / 2 = 15 X .2" = 3.0") (ref. sec. table 1005.1)
**** Egress width provided = (3) @ 36"***

F. ACTIVE FIRE SAFETY FEATURES

	Req.	Prov.
Fire Alarm System:	✓	✓
Manual Pull Station:	✓	✓
Exit Signs:	✓	✓
Minimum Egress Lighting:	✓	✓
Fire Extinguishers:	✓	✓
Fire Sprinklers:		
Smoke Detection:	✓	✓
Emergency Lighting:	✓	✓
Duct Detection:		
Fire Pump:		
Fire proof Paint:		

G. STRUCTURAL FIRE RATINGS (T-601)

Structural frame including columns, girders & trusses:	NR
Bearing exterior walls:	NR
Bearing interior walls:	NR
Nonbearing exterior walls & partitions:	NR
Nonbearing interior walls & partitions:	NR
Floor construction including supporting beams & joists:	NR
Roof construction including supporting beams & joists:	NR

H. Building Elements Fire Resistance (Table 601) Rating Requirements

	Admin Type B	Apparatus Type F1
Structural frame	**2**	**0**
Non bearing wall & interior partition	**1**	**0**
Floor construction	**1**	**0**
Roof construction	**1**	**0**
Exterior wall (ref. table 602)	**2**	**0**

Fire Seperation - 1 Hr. Reqt. (508.2)

I. FIRE PROTECTION SYSTEM (CHAPTER 9)

Required: Pull - stations per Fire Marshall.

J. PLUMBING REQUIREMENTS (61 - Total occupancy) (Table 2902.1)

	M	W	M	W	M	-
PLUMBING FIXTURE COUNT	LAVATORY		WATER CLOSET		URINAL	
FLOOR PLAN	*2*	*2*	*2*	*2*	*0*	
TOTAL:	*4*		*4*		*0*	

Drinking Fountain = 1
SWRS = 1/15:.

SYMBOL	DESCRIPTION	PROTECTIVE ELEMENTS
	EXIT - EXTERIOR	
	EXIT - INTERIOR (assembly occ over 50 and exits from floors)	
F.E.	***FIRE EXTINGUISHER***	
FEC	***FIRE EXTINGUISHER CABINET***	
	FIRE EXTINGUISHER SPACING (show radius)	
	NON PROTECTED EXIT PATH	
	1 HOUR FIRE BARRIER	***1-hour Fire Barrier wall construction. 3/4 hour rated door assembly. Fire Dampers***
	2 HOUR FIRE BARRIER	***2-hour Fire Barrier wall construction. 1 1/2 hour rated door assembly. Fire Dampers***
	1 HOUR SHAFT	***1-hour Fire Barrier wall construction. 1 hour rated door assembly. Fire Dampers***
	SMOKE BARRIER	***Not rated, wall shall be constructed to restrict the movement of smoke. Refer to NFPA 101, Section 8.5 for requirements.***
	SMOKE PARTITION	***Not rated, wall shall be constructed to limit the passage of smoke. Refer to IBC Section 710 and NFPA 101 Section 8.4 for requirements.***
198 / 39.6 68"	***ACCUMULATED EXIT WIDTH AT REQUIRED EXIT (clear width)***	*Provided width* / *Occupants / Required width*
	PUBLIC FIRE HYDRANT (show distance from building)	
CONF. / B 12	***ROOM DESIGNATION***	***Room type / Occupancy type***
	ACCUMULATED OCCUPANT LOADS FOR COMPLEX EXIT PATHS	***Maximum Allowable Occupants***

2 CODE ANALYSIS
Scale: N.T.S.

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TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT — STATE OF TEXAS — RICARDO ALVARADO — 23141

DATE: 11/06/20

DRAWING TITLE:
CODE INFORMATION - BASE BID

FILE NAME:

JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: G0.02

100% CD's – FOR CONSTRUCTION



0 40' 80' 160' 240'

SCALE: 1" = 80'

N

TRUE NORTH

5 SURVEY AS FURNISHED BY OWNER (FOR INFORMATIONAL PURPOSES ONLY)
Scale: 1" = 80'

100% CD's - FOR CONSTRUCTION

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
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WESLACO, TX 78596
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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
.
MERCEDES, TEXAS

DATE: 11/06/20

DRAWING TITLE: SURVEY

FILE NAME:

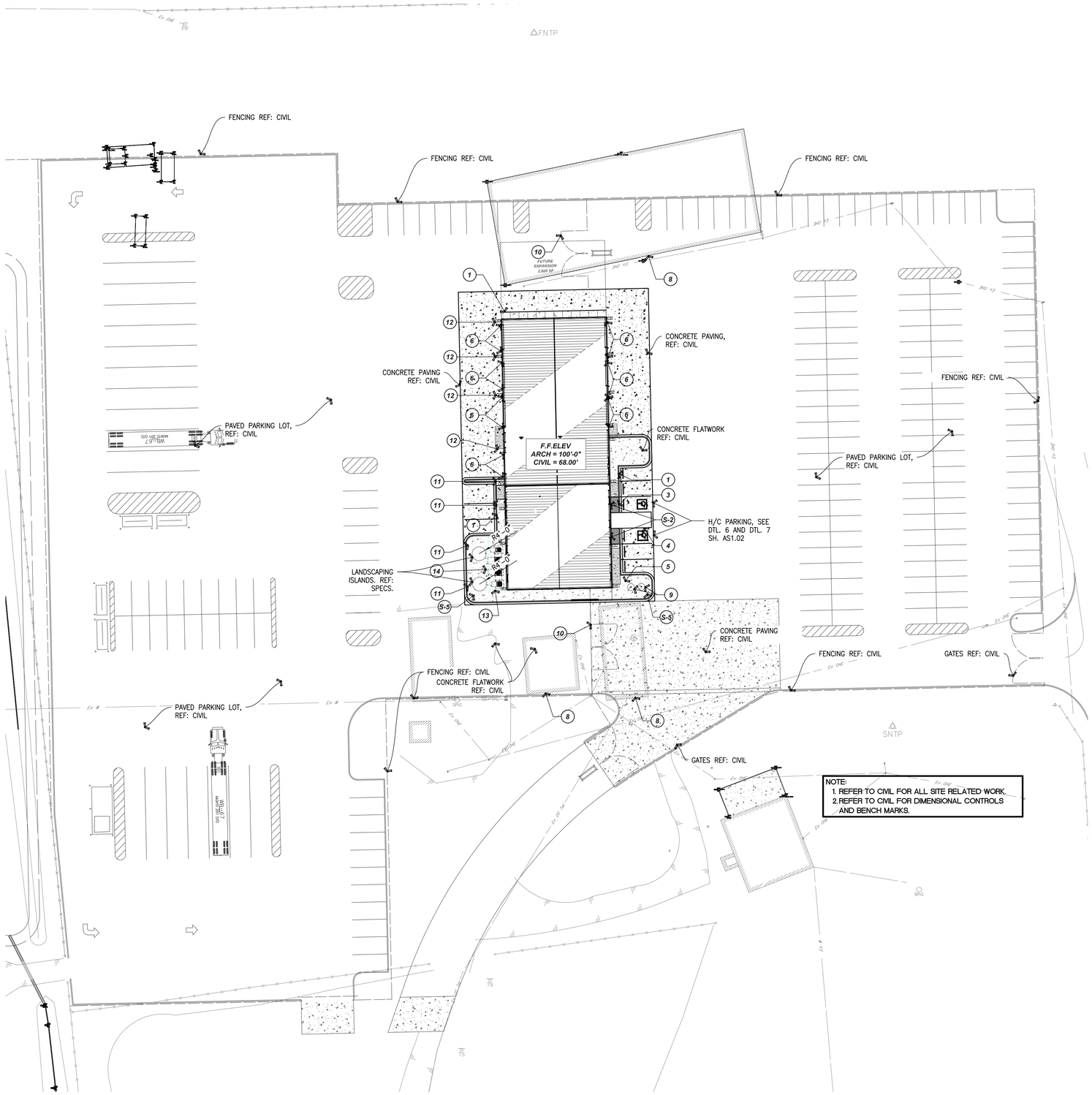
JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: G0.03



5 ARCHITECTURAL SITE PLAN
Scale: 1" = 30'

GENERAL SITE PLAN NOTES

1. COORDINATE ALL SPOT ELEVATIONS AND DIMENSIONS WITH CIVIL/LANDSCAPE/STRUCTURAL DRAWINGS.
2. PROVIDE POSITIVE DRAINAGE OF 1% MINIMUM / 2% MAXIMUM AT ALL EXTERIOR PAVED PEDESTRIAN AREAS SUCH AS SIDEWALKS, PATIOS, STAIRS, ETC. UNLESS NOTED OTHERWISE.
3. PROVIDE POSITIVE DRAINAGE AWAY FROM THE BUILDING OF 5% FOR A DISTANCE OF 10 FEET UNLESS NOTED OTHERWISE.
4. FINISH GRADE SLOPES SHALL BE NO STEEPER THAN 1 FOOT VERTICAL IN 3 FEET HORIZONTAL.

KEYED NOTES

1. CONCRETE WALK, REFER TO CIVIL
2. PARKING SIGN / BOLLARD
3. HANDICAPPED RAMP, REF: DTLS./A1.02
4. HANDICAPPED STRIPING, REF: DLTS./1.02
5. NEW MASONRY PAVERS. REF: SPECS.
6. CONCRETE FILLED STEEL BOLLARDS (TYP.), SEE DTL. 9/A1.02. REF: SPECS.
7. 10'x10' CMU ENCLOSED DUMPSTER W/GATES. REF: DTLS./A1.02
8. EXISTING WORK SHED TO BE DEMOLISHED POST CONSTRUCTION BY CLIENT.
9. NEW ALUM. FLAG POLES (2). SEE DTL. 3/A1.01. REF: SPECS.
10. NEW 6' TALL CHAIN-LINK FENCE AND MOTORIZED GATES. COORDINATE EXACT LOCATION WITH ARCHITECT
11. NEW TRENCH DRAIN AND A.D.A. COMPLIANT MTL. COVER. CONNECT TO DOWNSPOUT TO BOOT. REF: SPECS. & DTLS./A1.02
12. NEW CONCRETE SPLASH BLOCKS. REF: DTL 18/A3.02
13. NEW 4'-0" HIGH CHAINLINK FENCE WITH PRIVACY SLATS
14. NEW 4'-0" HIGH x 3'-0 WIDE CHAINLINK GATE

LEGEND

CHAIN-LINK FENCE — X — X —
CHAIN-LINK SWING GATE
CHAIN-LINK SLIDING GATE

SIGNAGE LEGEND

S-1 DO NOT ENTER
S-2 H/C PARKING
S-3 STAFF PARKING
S-4 AUTHORIZED VEHICLES ONLY
S-5 VISITOR PARKING

SIGNAGE NOTES:
1. REFER TO DETAIL 15 SHEET AS1.02 FOR SIGNAGE SCHEDULE.
2. COORDINATE WITH OWNER FOR SIGNAGE THAT IS TO BE INSTALLED OUTSIDE PROJECT BOUNDRY.

GENERAL NOTES

1. ALL WORK, MATERIALS, AND METHODS SHALL BE IN CONFORMANCE WITH THE CODES, ORDINANCES AND REGULATIONS OF ALL GOVERNMENTAL AGENCIES HAVING JURISDICTION AT THE PROJECT LOCATION.
2. CONTRACTOR SHALL PROVIDE AND IS SOLELY RESPONSIBLE AND LIABLE FOR PUBLIC AND EMPLOYEE PROTECTION AS NECESSARY AND AS REQUIRED BY THE CODES, INCLUDING EXTERIOR PEDESTRIAN AND TRAFFIC BARRIERS. ALL WORK SHALL CONFORM TO ORDINANCES AND REGULATIONS OF GOVERNMENTAL AGENCIES HAVING JURISDICTION AT THE PROJECT LOCATION.
3. CONTRACTOR SHALL IDENTIFY AND MINIMIZE THE NUMBER OF EXISTING FENCE PANELS TO BE REMOVED TO ACCESS PROJECT SITE PRIOR TO CONSTRUCTION. CONTRACTOR IS REQUIRED TO REINSTALL FENCING PANELS AT CLOSE OF PROJECT.

GENERAL DEMOLITION NOTES

1. ALL EQUIPMENT WILL BE REMOVED OR RELOCATED BY THE CONTRACTOR AS NECESSARY PRIOR TO THE DEMOLITION WORK OF THIS PROJECT. CONTRACTOR SHALL COORDINATE WITH OWNER AS REQUIRED.
2. OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL EQUIPMENT AND SALVAGE MATERIAL TO BE REMOVED. CONTRACTOR TO TRANSPORT ANY SALVAGE MATERIAL TO THE OWNER'S FACILITIES AT NO ADDITIONAL EXPENSE TO THE OWNER.
3. CONTRACTOR IS TO VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO DEMOLITION ACTIVITIES.
4. CONTRACTOR SHALL PROTECT ALL EXISTING CONSTRUCTION NOTED TO REMAIN FROM DAMAGE AND SOILING DURING DEMOLITION. REMOVE DEBRIS REGULARLY AS NECESSARY TO ELIMINATED INTERFERENCE WITH ROADS, STREET, WALKS, AND ALL OTHER ADJACENT FACILITIES.
5. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION OF TEMPORARY DUST AND NOISE PROOF PARTITION BETWEEN CONSTRUCTION AREA AND ADJACENT PROPERTIES AS NECESSARY.
6. NOTIFY THE BUILDING OWNER OF ANY MATERIALS, FIXTURES, ETC. THAT ARE TO BE REMOVED THAT ARE DEEMED SALVAGEABLE TURN OVER ANY REQUESTED ITEMS TO THE BUILDING OWNER IN GOOD CONDITION.
7. THE CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.
8. CONTRACTOR SHALL PROVIDE TRAFFIC HANDLING MEASURES AS NECESSARY TO PROTECT THE GENERAL PUBLIC AT ALL TIMES, AND AS REQUIRED BY THE CITY.
9. DO NOT INTERRUPT EXISTING UTILITIES, EXCEPT WHEN AUTHORIZED IN WRITING BY AUTHORITIES HAVING JURISDICTION. PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES, AS ACCEPTABLE TO GOVERNING AUTHORITIES.
10. WHEN UTILITY SERVICES ARE REQUIRED TO BE REMOVED, RELOCATED, OR ABANDONED, PROVIDE BYPASS CONNECTIONS TO MAINTAIN CONTINUITY OF SERVICE BEFORE PROCEEDING WITH DEMOLITION.
11. CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT ALL UTILITY COMPANIES INCLUDING BUT NOT LIMITED TO THE FOLLOWING: ELECTRIC, GAS, WATER, TELEPHONE, STORM SEWER, AND SANITARY SEWER FOR FIELD LOCATION OF ALL UNDERGROUND AND OVERHEAD UTILITY LINES. PRIOR TO COMMENCEMENT WITH ANY DEMOLITION WORK, CONTRACTOR SHALL IDENTIFY ALL ELECTRICAL CIRCUITS SERVICING THE AREA INVOLVED WITH THIS DEMOLITION. THOSE CIRCUITS SHALL THEN BE LOCKED OUT AND TAGGED OUT IF THEY DO NOT SERVICE ANY OF THE SURROUNDING FACILITIES. THOSE CIRCUITS WHICH ARE IDENTIFIED TO SERVICE BOTH THE AREA TO BE DEMOLISHED AND ADJACENT BUILDINGS SHALL BE SPLIT SO AS TO KILL ALL ELECTRICAL POWER TO THE AREA TO BE DEMOLISHED WHILE MAINTAINING POWER TO THE REMAINDER OF THE SITE.
12. REFER TO MEP DRAWINGS FOR DEMOLITION OF MEP SYSTEMS TO IDENTIFY WORK REQUIRED BY THIS CONTRACTOR WHICH MAY AFFECT DEMOLITION AND/OR REPAIRS OF ARCHITECTURAL ELEMENTS. COORDINATE WITH RELATED SUBS THE EXTENT OF ALL DEMOLITION WORK.
13. REMOVE ANY EXISTING VINYL MATERIALS IN ACCORDANCE WITH EPA STANDARDS, NOTIFY ARCHITECT & OWNER OF ANY ADDITIONAL ASBESTOS CONTAINING MATERIALS DISCOVERED BEFORE PROCEEDING WITH WORK, PROTECT INTERIOR CONSTRUCTION TO REMAIN DURING DEMOLITION AND CONSTRUCTION.

REVISIONS

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ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
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SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/20

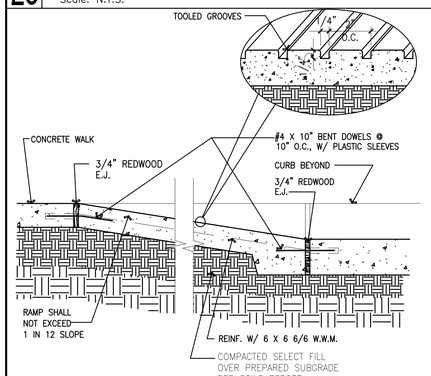
100% CD's - FOR CONSTRUCTION

DRAWING TITLE: ARCHITECTURAL SITE PLAN

FILE NAME:
JOB NO.: 1718
DATE: 11/06/2020
DRAWN BY: MG
CHECKED BY: E.A. II/ E.A. III
SHEET: AS1.00

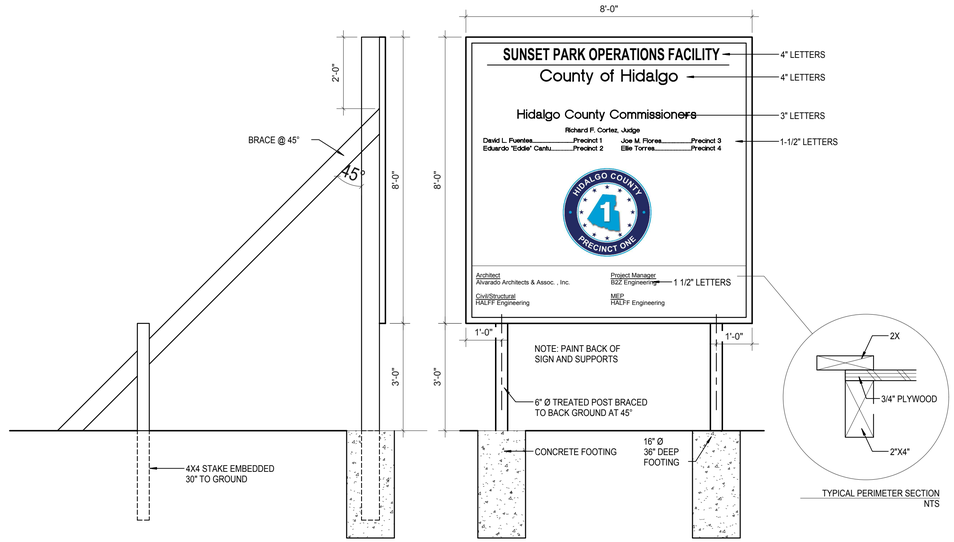
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Scale: N.T.S.

19 NOT USED
Scale: N.T.S.

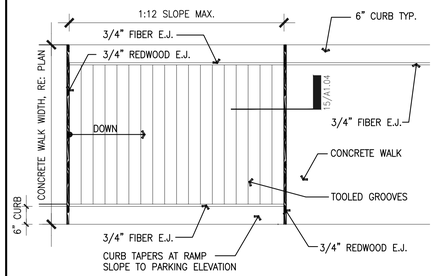


15 ACCESSIBLE RAMP SECTION
Scale: 1" = 1'-0"

14 NOT USED
Scale: N.T.S.



13 JOB SITE SIGNAGE DETAIL
Scale: 1/2" = 1'-0"

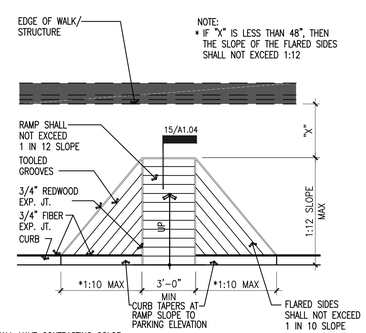


RAMP SHALL HAVE CONTRASTING COLOR WITH COLOR INTEGRAL TO CONCRETE AS SELECTED BY ARCHITECT

10 ACCESSIBLE RAMP PLAN
Scale: 1/4" = 1'-0"

9 NOT USED
Scale: N.T.S.

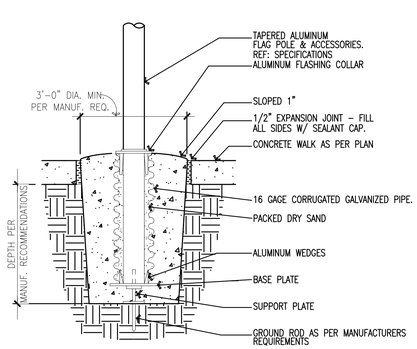
7 NOT USED
Scale: N.T.S.



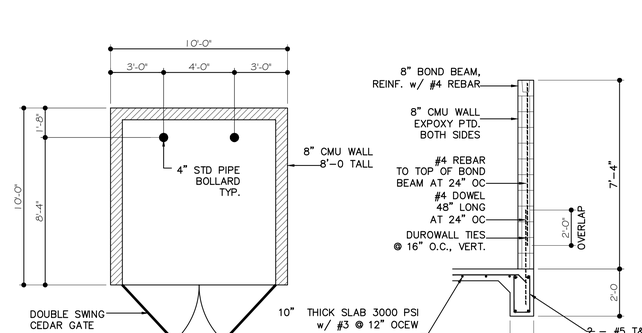
RAMP SHALL HAVE CONTRASTING COLOR WITH COLOR INTEGRAL TO CONCRETE AS SELECTED BY ARCHITECT

5 ACCESSIBLE RAMP
Scale: 1/4" = 1'-0"

4 NOT USED
Scale: N.T.S.



3 FLAG POLE BASE
Scale: 1" = 1'-0"



2 DUMPSTER FLOOR PLAN
Scale: 1/4" = 1'-0"

100% CD's - FOR CONSTRUCTION

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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/20

DRAWING TITLE: SITE DETAILS

FILE NAME:

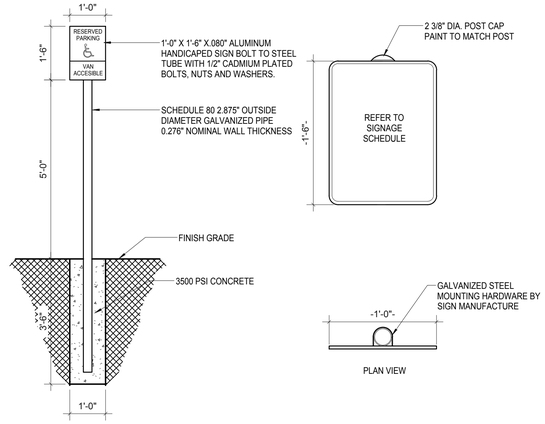
JOB NO.: 1718

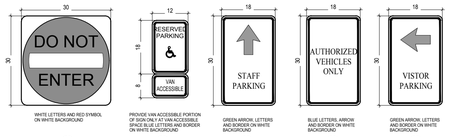
DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. IV/ E.A. III

SHEET: AS1.01

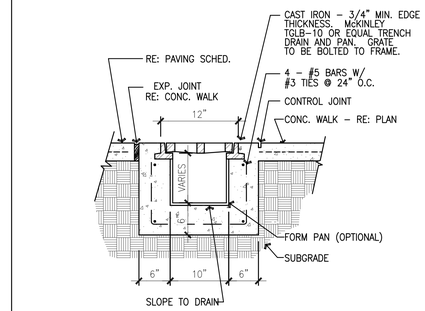




15 SIGNAGE DETAILS AND LEGEND
Scale: 1/2" = 1'-0"

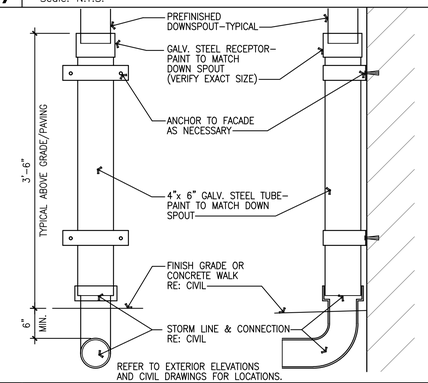
18 NOT USED
Scale: N.T.S.

17 NOT USED
Scale: N.T.S.

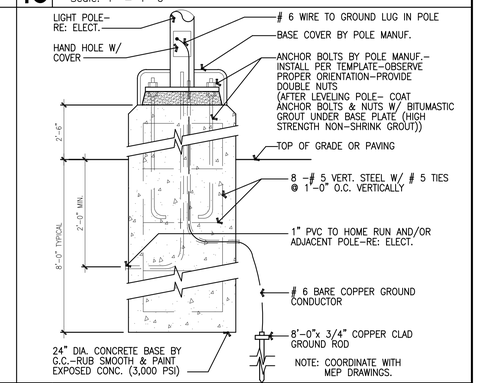


16 TRENCH DRAIN
Scale: 1" = 1'-0"

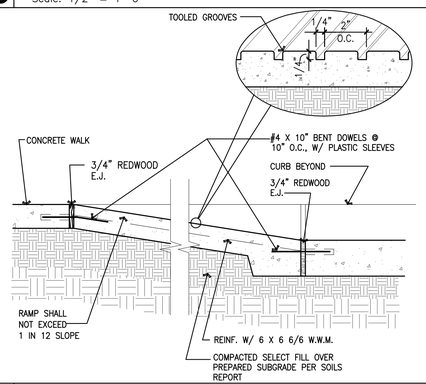
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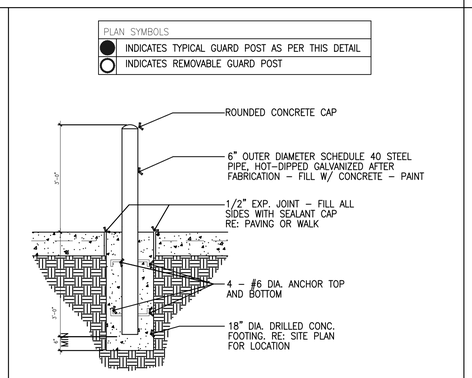
12 DOWN SPOUT BOOT
Scale: 1" = 1'-0"



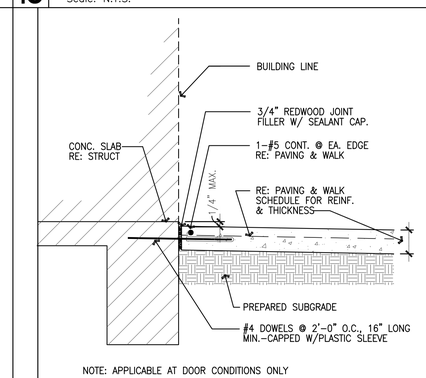
11 LIGHT POLE BASE
Scale: 1" = 1'-0"



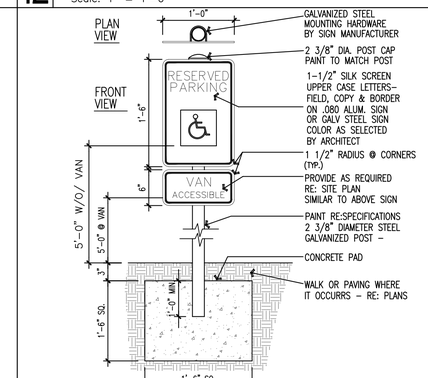
10 ACCESS RAMP SECTION
Scale: 1" = 1'-0"



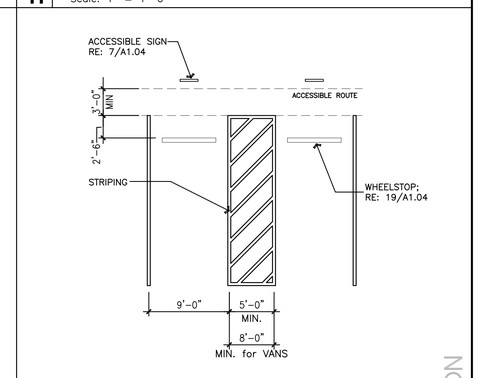
9 GUARD POST
Scale: 1" = 1'-0"



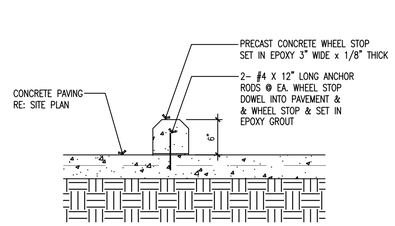
8 WALK AT EDGE OF BLDG.
Scale: 1" = 1'-0"



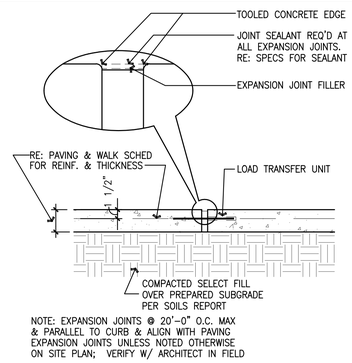
7 ACCESSIBLE PARKING SIGN (1/SPACE)
Scale: 1" = 1'-0"



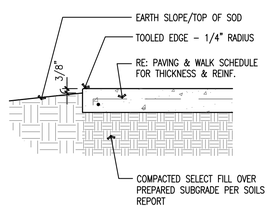
6 ACCESSIBLE STRIPING
Scale: 1" = 1'-0"



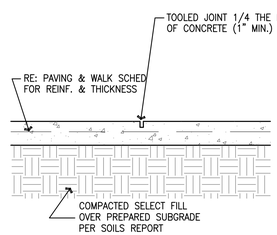
5 CONCRETE WHEEL STOP
Scale: 1" = 1'-0"



4 CONCRETE WALK EXPANSION JOINT
Scale: 1" = 1'-0"



3 CONCRETE WALK EDGE
Scale: 1" = 1'-0"



NOTE: CONTROL JOINTS @ 5'–0" O.C. MAX. UNLESS NOTED OTHERWISE ON SITE PLAN. VERIFY W/ ARCHITECT IN FIELD PRIOR TO INSTALLATION

2 CONCRETE WALK C.J.
Scale: 1" = 1'-0"

AREA	CONCRETE THICKNESS	REINFORCING
SIDEWALKS AND ENTRY WALKS	4"	6 X 6 #6 W.W.M. FLAT (NOT ROLLED)
PARKING AREAS (NON–SHADED AREAS)	5"	#3 BARS @ 15" O.C. EACH WAY
PARKING DRIVE AREAS (SHADED AREAS)	5"	#3 BARS @ 15" O.C. EACH WAY
MECHANICAL YARDS WITH OUT VEHICLE TRAFFIC	6"	#3 BARS @ 12" O.C. EACH WAY

1 PAVING + WALK SCHEDULE
Scale: 1" = 1'-0"

REVISIONS

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ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ENRIQUE ALVARADO JR. 23004 STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE: SITE DETAILS

FILE NAME:

JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: AS1.02

100% CD's FOR CONSTRUCTION

GENERAL CONSTRUCTION NOTES:

1) ALL IMPROVEMENTS TO BE IN ACCORDANCE WITH COUNTY CODES.

2) CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING FACILITIES PRIOR TO CONSTRUCTION.

3) CONTRACTOR TO PLAN AND PERFORM HIS WORK IN A MANNER THAT WILL PERMIT SAFE PUBLIC TRAFFIC MOVEMENT ON ALL STREETS.

4) TEMPORARY TRAFFIC CONTROL DURING CONSTRUCTION TO BE IN ACCORDANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

5) CONTRACTOR SHALL PROVIDE PROTECTIVE DEVICES SUCH AS SIGNS, LIGHTS, AND SIGNALS FOR THE SAFETY OF THE PUBLIC AND WORKERS, AS REQUIRED. (NO SEPARATE PAY)

6) CONTRACTOR TO BE RESPONSIBLE FOR PROTECTION AND/OR SAFETY OF THE WORK SITE, WORKERS, SUBCONTRACTORS, MATERIALS AND/OR EQUIPMENT.

7) CONSTRUCTION STAKING SHALL BE PROVIDED BY THE CONTRACTOR AND AT CONTRACTOR'S EXPENSE. BASE LINES ARE STAKED AS SHOWN ON PLANS. ALL DIMENSIONS ARE TO BACK OF CURBS UNLESS SHOWN OTHERWISE.

8) MATERIAL TESTING SHALL BE PAID FOR BY THE PRECINT. THE TESTING LAB SHALL BE CHOSEN BY THE COUNTY. RE-TEST TO BE AT CONTRACTOR'S EXPENSE.

9) CONTRACTOR SHALL COORDINATE WITH TXDOT REGARDING ALL WORK LOCATED WITHIN TXDOT R.O.W. 72 HOURS PRIOR TO COMMENCMENT

10) ANY DAMAGE TO EXISTING PAVEMENT, DRAINAGE OR EXISTING STRUCTURES SHALL BE REPAIRED TO PRE-CONSTRUCTION CONDITION AT CONTRACTOR'S EXPENSE.

11) 'THESE PLANS, PREPARED BY HALFF ASSOCIATES, INC. DO NOT EXTEND TO OR INCLUDE DESIGN OR SYSTEMS PERTAINING TO THE SAFETY OF THE CONSTRUCTION CONTRACTOR OR ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN THE PERFORMANCE OF THE WORK. THE SEAL OF HALFF ASSOCIATES, INC. REGISTERED PROFESSIONAL ENGINEER(S) HEREON DOES NOT EXTEND TO ANY SUCH SAFETY SYSTEMS THAT MAY NOW OR HEREAFTER BE INCORPORATED IN THESE PLANS. THE CONSTRUCTION CONTRACTOR SHALL PREPARE OR OBTAIN THE APPROPRIATE SAFETY SYSTEMS, INCLUDING THE PLANS AND SPECIFICATIONS REQUIRED BY THE HOUSE BILLS 622 AND 665 ENACTED BY THE TEXAS LEGISLATURE IN THE 7-TH LEGISLATURE REGULAR SESSION.'

12) CONTRACTOR SHALL GIVE NOTICE TO ALL AUTHORIZED INSPECTORS, SUPERINTENDENTS, OR PERSONS IN CHARGE OF PRIVATE AND PUBLIC UTILITIES AFFECTED BY HIS OPERATIONS 72 HOURS PRIOR TO COMMENCEMENT OF WORK. NOTIFY TEXAS ONE CALL FOR UTILITY LOCATIONS PRIOR TO ANY & ALL EXCAVATIONS.

13) CONTRACTOR TO COORDINATE WITH THE COUNTY ON WORK SCHEDULES, TESTING, GENERAL INSPECTION, AND EXISTING LINES.

14) CONTRACTOR TO EXERCISE CAUTION WHEN WORKING NEAR EXISTING FACILITIES AND/OR UTILITIES. ALL DAMAGE TO BE REPAIRED AT CONTRACTOR'S EXPENSE. ALL COSTS FOR INTERRUPTION OF GAS, ELECTRICAL, COMMUNICATIONS AND/OR WATER SERVICE DUE TO CONTRACTOR'S WORK SHALL BE BORNE BY THE CONTRACTOR.

15) INFORMATION ON EXISTING UTILITIES IS FROM BEST AVAILABLE INFORMATION OF RECORD AND SPOT FIELD LOCATIONS. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION AND LOCATION OF THESE UNDERGROUND UTILITIES AS REQUIRED AT NO SEPARATE PAY. COUNTY PERSONNEL WILL BE AVAILABLE FOR ASSISTANCE AND OPERATION OF VALVES AS REQUIRED. CONTRACTOR TO COORDINATE WITH OTHER UTILITIES COMPANIES,ELECTRICAL UTILITIES, GAS UTILITIES AND TELEPHONE UTILITIES.

16) ALL SPOIL MATERIAL AND DEBRIS SHALL BE DISPOSED OFF SITE BY CONTRACTOR IN A LEGAL MANNER. FURNISHING AND TRANSPORTATION OF ALL OFF SITE MATERIAL TO BE AT CONTRACTOR'S EXPENSE.

17) UPON COMPLETION OF CONSTRUCTION CONTRACTOR SHALL RETURN THE SITE TO ORIGINAL CONTOURS UNLESS DIFFERENT FINISHED ELEVATIONS ARE SHOWN ON PLANS. CONTRACTOR TO INSURE NO AREAS OF PONDING ARE PRESENT.

18) CONCRETE NOTES:
   A) ALL CONCRETE WORK TO BE FORMED, UNLESS OTHERWISE APPROVED.
   B) ALL CONCRETE TO BE 3000-PSI MINIMUM AT 28 DAYS, UNLESS OTHERWISE SHOWN. STRENGTH TO BE DETERMINED BY CYLINDER BREAK TEST.
   C) ALL REINFORCING STEEL TO BE ASTM A-615, GRADE 60, UNLESS OTHERWISE SHOWN.
   D) ALL EXPOSED CONCRETE WORK TO BE CHAMFERED.

19) CONTRACTOR TO INSURE SAME DAY ACCESS ALL RESIDENCES AND BUSINESSES ADJACENT TO CONSTRUCTION.

20) DEMOLITION, REMOVAL & DISPOSAL OF ALL EXCESS CONCRETE, CURBS, RUBBLE, ETC. TO BE DONE IN A LEGAL MANNER AT CONTRACTOR'S EXPENSE.

21) ALL STRUCTURES TO BE ADJUSTED BY THE CONTRACTOR TO MEET FINAL GRADES, A MAXIMUM OF 2 FEET OF THROAT RINGS WILL BE ALLOWED.

PAVING CONSTRUCTION NOTES:

1) HOT MIX ASPHALT CONCRETE TO BE IN ACCORDANCE WITH TXDoT SPECIFICATION TYPE "D" ITEM 340.

2) SUBGRADE EXCAVATION, MIXING OF CEMENT, AND RECOMPACTION TO BE INCLUDED IN PRICE BID PER SQUARE YARD FOR "CEMENT TREATED SUBGRADE."

3) CONTRACTOR TO FILL BEHIND CURBS AND WALKS AND SHAPE TO INSURE PROPER DRAINAGE.

4) CONSTRUCTION JOINTS TO EXISTING PAVEMENT SHALL BE MADE BY EITHER CUTTING BACK EXISTING TO PRODUCE A SLIGHTLY BEVELED EDGE FOR THE FULL THICKNESS OF THE WEARING COURSE OR A SUITABLE LAP JOINT SHALL BE MADE. SAW CUTTING REQUIRED.

5) NO TRAFFIC SHALL BE ALLOWED ON THE FINISHED WEARING SURFACE UNTIL AT LEAST 12 HOURS AFTER COMPLETION OF ROLLING.

6) HOT MIX ASPHALT CONCRETE TRANSPORT TRUCKS TO BE EQUIPPED WITH CANVAS COVERS TO BE UTILIZED DURING MATERIAL HAULING. MATERIAL DELIVERED TO SITE AT IMPROPER TEMPERATURE SHALL BE REJECTED. HOT MIX SHALL BE LAID AT A MINIMUM TEMPERATURE OF 225°F.

7) WHEN TYING INTO EXISTING CURB, EXPOSE REBAR AND FORM EXPANSION JOINT PER DETAIL SHEET.

8) ANY SETTLEMENT UNDER PAVEMENT DUE TO INADEQUATE COMPACTION OF UTILITY LINE BACK FILL SHALL BE CAUSE FOR RECOMPACTION OF TRENCH AND REPLACEMENT OF PAVEMENT SECTION.

WASTEWATER COLLECTION LINE CONSTRUCTION NOTES:

1) ALL PROPOSED WASTEWATER COLLECTION LINES WILL BE SDR 26 PIPE MATERIAL (UNLESS OTHERWISE NOTED).

2) CONTRACTOR TO PROVIDE DEFLECTION TEST IN ACCORDANCE WITH T.C.E.Q. CHAPTER 317.2 (a), (4) (c). MANDREL TO BE PULLED IN BOTH DIRECTIONS

3) CONTRACTOR TO PROVIDE LOW PRESSURE AIR TEST IN ACCORDANCE WITH T.C.E.Q. CHAPTER 317.2 (a), (4) (b). 30 DAYS AFTER INSTALLATION. NO WATER TEST ALLOWED.

4) CONTRACTOR TO FIELD VERIFY THE LOCATION OF EXISTING UTILITIES & FACILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION.

5) ALL CROSSING OF WASTEWATER COLLECTION LINES AND WATERLINES CONSTRUCTED IN ACCORDANCE WITH T.C.E.Q. REGULATIONS CHAPTER 290 AND 317.

6) CONTRACTOR TO PROVIDE LEAKAGE TEST FOR MANHOLE IN ACCORDANCE WITH T.C.E.Q. CHAPTER 317.2 (c), (5) (h) OF THE STATE WASTEWATER CODE NO WATER TEST ALLOWED.

7) CONTRACTOR TO STAMP CURB AND GUTTER WITH "S"AT LOCATION OF WASTEWATER SERVICE LINES FOR VACANT LOTS.

8) NO WATER JETTING ALLOWED, MECHANICAL COMPACTION REQUIRED.

9) WASTEWATER MANHOLES SHALL INCLUDE A RAIN GUARD AND SHALL INCLUDE THE CITY LOGO.

WATERLINE CONSTRUCTION NOTES:

1) ALL WATER LINES TO BE C-900 CLASS 150 PVC UNLESS OTHERWISE NOTED.

2) DOUBLE CHECK VALVE WILL BE REQUIRED WHEN FILLING NEW WATERLINE FOR PRESSURE TESTING.

3) ALL WATER & WASTEWATER COLLECTION LINE CROSSING TO BE CONSTRUCTED IN ACCORDANCE WITH TCEQ REGULATION, CHAPTER 290 & 317.

4) CONTRACTOR TO FIELD LOCATE EXISTING METERS & PROPOSED SERVICE CONNECTION LOCATIONS PRIOR TO CONSTRUCTION OF MAIN.

5) CONTRACTOR TO VERIFY THE LOCATION OF ALL EXISTING LINES TO BE TIED IN TO NEW MAIN PRIOR TO SETTING LOCATION OF TIE-IN TEE OR TAPPING SLEEVE, & VALVE ON MAIN.

6) WATERLINE MAINS TO BE HYDROSTATICALLY & BACTERIOLOGICALLY TESTED PER COUNTY REQUIREMENTS PRIOR TO TIE-INS. COUNTY APPROVAL OF TESTING IS REQUIRED.

7) CONTRACTOR TO STAMP CURB AND GUTTER WITH "W" AT LOCATION OF WATER SERVICE LINES FOR VACANT LOTS FOR FUTURE USE.

8) CONTRACTOR SHALL MAINTAIN AS MINIMUMS 10 FEET HORIZONTAL AND 2 FEET VERTICAL SEPARATION BETWEEN WATERLINES AND ANY OTHER SEWER.

9) NO WATER JETTING ALLOWED, MECHANICAL COMPACTION REQUIRED.

10) FIRE HYDRANTS SHALL BE PLACED 3.0 FEET BEHIND BACK OF CURB AND FLANGE SHALL BE 6 INCHES ABOVE GRADE, AND SHALL BE PAINTED CAUTION YELLOW.

11) CONTRACTOR SHALL MAINTAIN A MINIMUM OF 3FT OF COVER ON ALL WATERLINES.

12) FITTINGS TO BE USED ON DEFLECTIONS AS NEEDED AND SHALL BE SUBSIDARY TO THE WATERLINE UNIT PRICE.

13) 2 INCH WATER SERVICES SHALL BE CONSTRUCTED OF COPPER OR POLYETHYLENE.

14) CONTRACTOR IS RESPONSIBLE FOR INSTALLING VALVES, FITTINGS, AND ALL INCIDENTALS AS NEEDED FOR A COMPLETE IN PLACE SYSTEM AND SHALL BE SUBSIDIARY TO PIPE INSTALLATION.

TRAFFIC CONTROL NOTES:

MAINTENANCE OF WORK ZONE TRAFFIC CONTROL DEVICES:

1) THOSE PORTIONS OF THE PROJECT WHICH REQUIRE CONSTRUCTION UNDER TRAFFIC WILL BE MAINTAINED IN A CONDITION ACCEPTABLE TO THE COUNTY ENGINEER. THIS WORK WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.

2) AT ANYTIME DURING THE PROSECUTION OF THIS PROJECT IF OTHER SIGNS, BARRICADES, ETC. ARE DEEMED NECESSARY TO CONTROL AND PROVIDE SAFETY FOR THE TRAVELING PUBLIC, THE CONTRACTOR SHALL PROVIDE THESE ADDITIONAL TRAFFIC CONTROL DEVICES. PAYMENT FOR THIS WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO BID.

3) THE CONTRACTOR SHALL TAKE CARE TO ASSURE THAT ALL TRAFFIC CONTROL DEVICES AND WORK ZONE PAVEMENT MARKINGS BE KEPT IN A HIGHLY VISIBLE CONDITION (CLEAN, UPRIGHT, AND PROPER LOCATION). THE CONTRACTOR SHALL HAVE ADEQUATE REPLACEMENT TRAFFIC CONTROL DEVICES AVAILABLE, AT ALL TIMES, TO REPLACE THOSE DAMAGED.

SIGNING:

4) THE CONTRACTOR SHALL COVER OR TEMPORARILY REMOVE EXISTING SIGNS THAT CONFLICT WITH THE SUGGESTED TRAFFIC CONTROL PLAN OR THE INTENT THEREOF.

5) EXISTING SIGNS THAT DO NOT CONFLICT WITH THE SUGGESTED TRAFFIC CONTROL PLAN OR THE INTENT THEREOF, BUT REQUIRE RELOCATION DUE TO PHYSICAL CONFLICTS SHALL NOT BE RELOCATED UNTIL TEMPORARY SIGN SUPPORTS HAVE BEEN INSTALLED TO ALLOW FOR THE IMMEDIATE RELOCATION OF ANY SUCH SIGNS.

6) THESE SIGNING MEASURES SHALL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED SUBSIDIARY TO BID.

PUBLIC ACCESS AND PEDESTRIAN SAFETY:

7) ANY PORTIONS OF THIS PROJECT THAT COINCIDE WITH EXISTING PUBLIC ROADS AND/OR PRIVATE DRIVES SHALL BE KEPT OPEN TO TRAFFIC AT ALL TIMES, UNLESS OTHERWISE DIRECTED OR APPROVED BY THE COUNTY.

8) THE CONTRACTOR SHALL BE REQUIRED TO MAINTAIN TWO-WAY TRAFFIC ON ALL PUBLIC ROADWAYS AT ALL TIMES UNLESS OTHERWISE NOTED ON THE PLANS.

9) FOR PEDESTRIAN SAFETY, THE CONTRACTOR SHALL INSTALL ORANGE PLASTIC CONSTRUCTION FENCING (3 FT TALL MINIMUM) AROUND ALL OPEN EXCAVATIONS. THE PLACEMENT OF THIS FENCING SHALL NOT OBSTRUCT SIGHT LINES OF THE TRAVELING PUBLIC.

10) THESE MEASURES FOR PUBLIC ACCESS AND PEDESTRIAN SAFETY WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO BID.

GENERAL

11) INSTALLATION AND MAINTENANCE OF ALL WORK ZONE SIGNS, BARRICADES, AND PAVEMENT MARKINGS IS THE RESPONSIBILITY OF THE CONTRACTOR, AND SHALL CONFORM TO THE BARRICADE AND CONSTRUCTION (BC) STANDARDS AND/OR THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

12) CONSTRUCTION IN ANY AREA THAT IS ADVERSELY AFFECTING TRAFFIC FLOW AND SAFETY MUST BE PURSUED DILIGENTY BY THE CONTRACTOR. IF IN THE OPINION OF THE CITY ENGINEER, THE CONTRACTOR IS NOT DILIGENTLY PURSUING THE CONSTRUCTION IN THOSE AREAS, THE ENGINEER MAY REQUIRE THE CONTRACTOR TO CHANGE HIS WORK SCHEDULE TO EXPEDITE COMPLETION IN THOSE AREAS OF CONCERN.

13) THE CONTRACTOR MAY REQUEST TO ALTER THE TRAFFIC CONTROL PLAN, BUT ANY REQUESTS MUST BE SUBMITTED TO THE CITY ENGINEER IN WRITING. IF THE REQUEST FOR A CHANGE IN THE TRAFFIC CONTROL IS EXTENSIVE, THE COUNTY ENGINEER MAY REQUIRE THE CONTRACTOR TO PROVIDE PLAN SHEET REVISIONS OUTLINING HIS CHANGE; THESE PLAN SHEET REVISIONS WILL BE PROVIDED BY THE CONTRACTOR AT HIS OWN EXPENSE. ANY CHANGES TO THE TRAFFIC CONTROL PLAN WILL BE SUBJECT TO THE COUNTY ENGINEER'S WRITTEN APPROVAL.

14) FLASHING WARNING LIGHTS AND/OR FLAGS SHALL BE USED TO CALL ATTENTION TO THE EARLY WARNING SIGNS.

15) STEADY BURN (TY C) WARNING LIGHTS SHALL BE USED TO MARK CHANNELIZING DEVICES AT NIGHT AS NEEDED.

16) ADDITIONAL SIGNS, BARRICADES, AND/OR OTHER CHANNELIZING DEVICES MAY BE REQUIRED AND/OR ADJUSTED AS DIRECTED BY THE COUNTY ENGINEER.

17) WHEN CONSTRUCTION OPERATIONS RESULT IN DROP OF MORE THAN 2 INCHES NEXT TO TRAVEL WAY A 3:1 SLOPE AND 4.0 FEET BUFFER ZONE WILL BE REQUIRED DURING NON WORKING HOURS.

18) FOR POSTED SPEEDS EXCEEDING 30 MPH, ADVISORY SPEED SIGNS WITH APPROPRIATE WARNING SIGNS, SHALL BE POSTED IN THE VICINITY SPECIFIC WORK ZONES WITH THE PROJECT LIMITS, UNLESS OTHER SIDE DIRECTED BY THE COUNTY ENGINEER.

19) LENGTH AND SPACING OF CHANNELIZING DEVICES SHALL BE AS SHOWN ON THE BC STANDARDS AND THE "T.M.U.T.C.D." OTHER SIGNS MAY BE USED IN ADDITION TO THOSE REQUIRED BY BARRICADE STANDARDS.

20) ALL WORK SHALL BE DONE EXPEDITIOUSLY DURING DAYLIGHT HOURS, OR AS DIRECTED BY THE COUNTY ENGINEER. NECESSARY FLAGGERS AND APPROPRIATE SIGNING TO SAFELY GUIDE TRAFFIC THROUGH THE WORK AREA WILL BE REQUIRED AS DIRECTED BY THE COUINTY ENGINEER.

21) REFER TO STANDARD TRAFFIC CONTROL SHEETS FOR OTHER PERTINENT INFORMATION NOT SHOWN.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE

SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
500 WEST WILLIAM CANNON DRIVE, SUITE 100
AUSTIN, TEXAS 78745
(512) 777-4600
MCALLEN, TX 78503
(956) 664-0288

Revision No.	Date	Description

STATE OF TEXAS
RAUL GARCIA JR.
94855
LICENSED PROFESSIONAL ENGINEER
4/26/19

Project No.:	32885-001
Issued:	MARCH 2019
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Sheet Title

GENERAL NOTES

C1.00

Sheet Number

MCA
ESD/MCD-2017

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ALTERNATE 3
EXIST. 208 LF FENCE
TO BE REMOVED

ALTERNATE 3
EXIST. FUEL TANK
TO BE RELOCATED

ALTERNATE 3
EXIST. FUEL TANKS
TO BE RELOCATED

ALTERNATE 3
EXIST. FUEL TANK
TO BE RELOCATED

ALTERNATE 3
EXIST. 341.12 LF FENCE
TO BE REMOVED

ALTERNATE 3
EXIST. LIGHT POLE
TO BE REMOVED

EXIST. METAL BARN TO
REMAIN UNTIL PROP.BUILDING
IS FULLY CONSTRUCTED CONTACT
OWNER FOR DEMOLITION PHASING

ALTERNATE 3
EXIST. 657 LF FENCE
TO BE REMOVED

EXIST. LIGHT POLE
TO BE REMOVED

ALTERNATE 3
EXIST. LIGHT POLE
TO BE REMOVED

EXIST. BUILDING TO
REMAIN UNTIL PROP.BUILDING
IS FULLY CONSTRUCTED CONTACT
OWNER FOR DEMOLITION PHASING

EXIST. BUILDING TO
REMAIN UNTIL PROP.BUILDING
IS FULLY CONSTRUCTED CONTACT
OWNER FOR DEMOLITION PHASING

EXIST. BUILDING TO
REMAIN UNTIL PROP.BUILDING
IS FULLY CONSTRUCTED CONTACT
OWNER FOR DEMOLITION PHASING

ALTERNATE 3
REMOVE AND DISPOSE OF
84 SY ASPHALT PAVEMENT

TBM #2

TBM #1

AREA OF DEMOLITION

AREA TO REMAIN UNTIL PROP.BUILDING
IS FULLY CONSTRUCTED CONTACT
OWNER FOR DEMOLITION PHASING

NOTES:

1. ALL MATERIAL TO BE REMOVED SHALL BE DISPOSED IN A LEGAL MANNER AT CONTRACTOR'S EXPENSE.
2. PAVEMENT REMOVAL IS INCLUDING, BUT NOT LIMITED TO, ASPHALT PAVEMENT , BASE MATERIAL, SUBGRADE, CURB & GUTTER, WHEEL STOPS AND CONCRETE SIDEWALK AS REQUIRED.

N

0 15 30 45 60

SCALE: 1"=30'

LEGEND

PROPOSED	EXISTING	
■	CI □	INLET
▨	GI □	GRATE INLET
●	MH ○	MANHOLE
◔	WV ○	GATE VALVE & BOX
	WM ⊕	WATER METER
✠	FH ●	FIRE HYDRANT
	SSCO ○	SANITARY CLEAN OUT
	LP ⊙	LIGHT POLE
	EB □	ELECTRIC BOX
	PP ⊘	POWER POLE
	TPED □	TELEPHONE PEDESTAL
	—x—x—	FENCE
	TS ▽	TRAFFIC SIGN
	—EX OHE—	OVERHEAD ELECTRIC
	—EX UGE—	UNDERGROUND ELECTRIC
	—Ex GAS—	GAS LINE
	—Ex F/O—	FIBER OPTIC LINE
	—Ex TEL—	TELEPHONE LINE
		ASPHALT PAVEMENT
	—EX 6"SS—	SAN. SEWER
W	—EX 6"W—	WATER
FIRE	—Ex FIRE—	FIRE PROTECTION
	36"SD	STORM SEWER
100.00	100.00	CONTOUR
		DRAINAGE FLOW ARROW
+ TP100.00		TOP OF PAVEMENT
+ TC100.00		TOP OF CURB
+ G100.00		GUTTER
+ FL100.00		FLOW LINE
+ TW100.00		TOP OF WALK
+ 100.00		FINISHED GRADE
		ASPHALT PAVEMENT
		HEAVY DUTY CONCRETE
		LIGHT DUTY CONCRETE
		↓ CAUTION ↓ UTILITY CROSSING

TBM #1
SET NAIL: SET ON TOP OF PAVEMENT
ON THE SOUTH EAST CORNER OF THE
SITE IMPROVEMENTS
ELEVATION = 68.87(NAVD88)
N=16604584.30
E=1170552.39
(NAD83)

TBM #2
SET NAIL: FOUND ON TOP OF PAVEMENT
ON THE NORTH END OF THE
SITE IMPROVEMENTS
ELEVATION = 65.07(NAVD88)
N=16604981.99
E=11170346.73
(NAD83)

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HIDALGO COUNTY PRECINCT ONE

HALFF
500 WEST MILITARY, SUITE 100
MCALLEN, TX 78503
(956) 664-0288

Revision No.	Date	Description

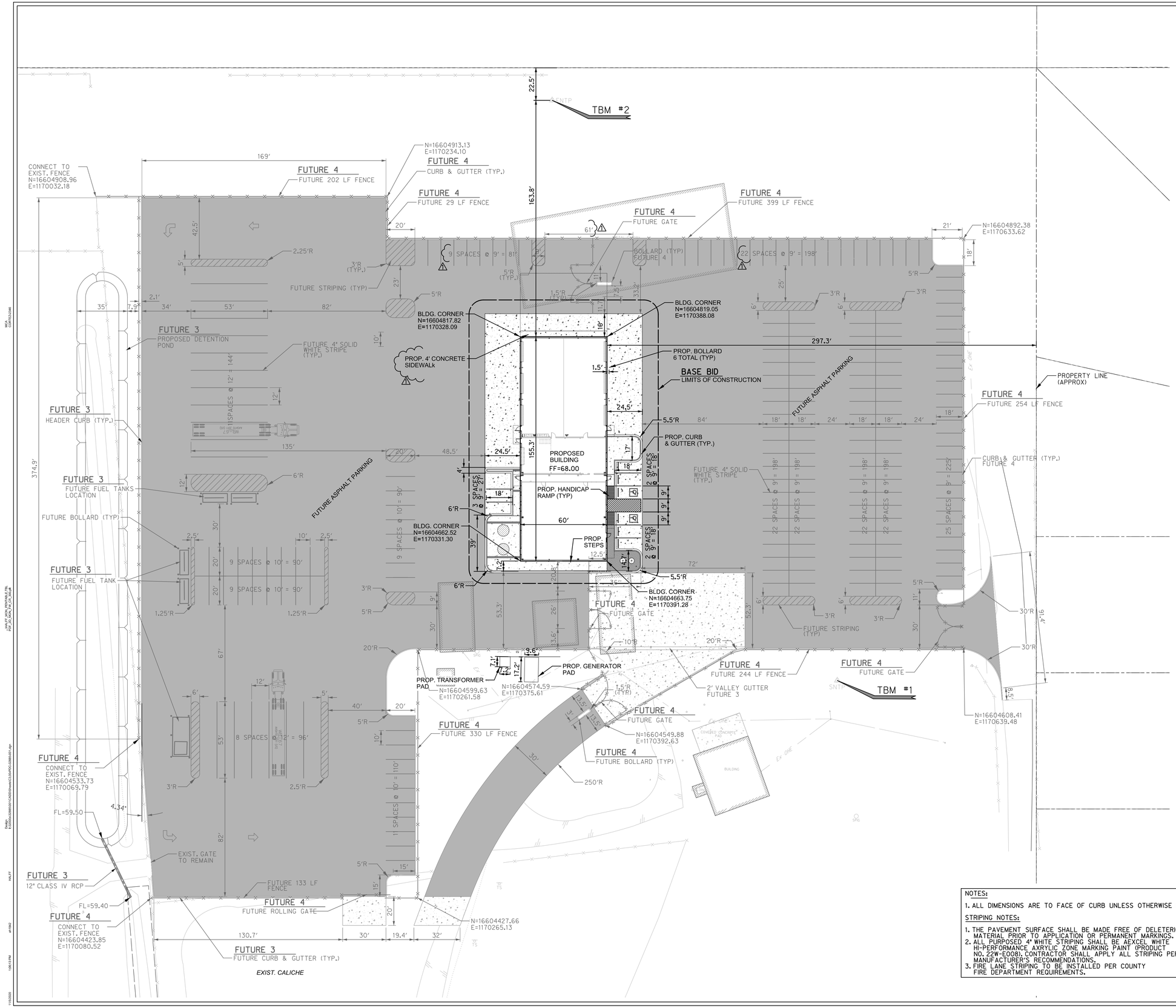
STATE OF TEXAS
RAUL GARCIA JR.
94855
LICENSED
PROFESSIONAL ENGINEER
4/25/19

Project No.:	32885-001
Issued:	MARCH 2019
Drawn By:	FC
Checked By:	RG
Scale:	AS NOTED

Sheet Title

DEMOLITION PLAN

C2.00
Sheet Number



LEGEND

PROPOSED	EXISTING	
■	CI □	INLET
▨	GI □	GRATE INLET
●	MH ○	MANHOLE
◘	WV ○	GATE VALVE & BOX
	WM ⊕	WATER METER
✠	FH ●	FIRE HYDRANT
	SSCO ○	SANITARY CLEAN OUT
	LP ⊙	LIGHT POLE
	EB □	ELECTRIC BOX
	PP ⊘	POWER POLE
	TPED □	TELEPHONE PEDESTAL
	—x—x—	FENCE
	TS ▽	TRAFFIC SIGN
	—EX OHE—	OVERHEAD ELECTRIC
	—EX UGE—	UNDERGROUND ELECTRIC
	—Ex GAS—	GAS LINE
	—Ex F/O—	FIBER OPTIC LINE
	—Ex TEL—	TELEPHONE LINE
		ASPHALT PAVEMENT
—SS—	—EX 6"SS—	SAN. SEWER
—W—	—EX 6"W—	WATER
—FIRE—	—Ex FIRE—	FIRE PROTECTION
	— 36"SD —	STORM SEWER
—100.00—	— 100.00 —	CONTOUR
→		DRAINAGE FLOW ARROW
+ TP100.00		TOP OF PAVEMENT
+ TC100.00		TOP OF CURB
+ G100.00		GUTTER
+ FL100.00		FLOW LINE
+ TW100.00		TOP OF WALK
+ 100.00		FINISHED GRADE
		ASPHALT PAVEMENT
		HEAVY DUTY CONCRETE
		LIGHT DUTY CONCRETE
		⚠ CAUTION ⚠ UTILITY CROSSING

NOTES:

1. ALL DIMENSIONS ARE TO FACE OF CURB UNLESS OTHERWISE NOTED.

STRIPING NOTES:

1. THE PAVEMENT SURFACE SHALL BE MADE FREE OF DELETERIOUS MATERIAL PRIOR TO APPLICATION OR PERMANENT MARKINGS.
2. ALL PURPOSED 4" WHITE STRIPING SHALL BE AEXCEL WHITE HI-PERFORMANCE AXRYLIC ZONE MARKING PAINT (PRODUCT NO. 22W-E008). CONTRACTOR SHALL APPLY ALL STRIPING PER MANUFACTURER'S RECOMMENDATIONS.
3. FIRE LANE STRIPING TO BE INSTALLED PER COUNTY FIRE DEPARTMENT REQUIREMENTS.

TBM #1
SET NAIL: SET ON TOP OF PAVEMENT ON THE SOUTH EAST CORNER OF THE SITE IMPROVEMENTS
ELEVATION = 68.87(NAVD88)
N=16604584.30
E=1170552.39
(NAD83)

TBM #2
SET NAIL: FOUND ON TOP OF PAVEMENT ON THE NORTH END OF THE SITE IMPROVEMENTS
ELEVATION = 65.07(NAVD88)
N=16604981.99
E=1170346.73
(NAD83)

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE

SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
500 WEST 7 MILITARY, SUITE 100
MCALLEN, TX 78503
(956) 664-0288

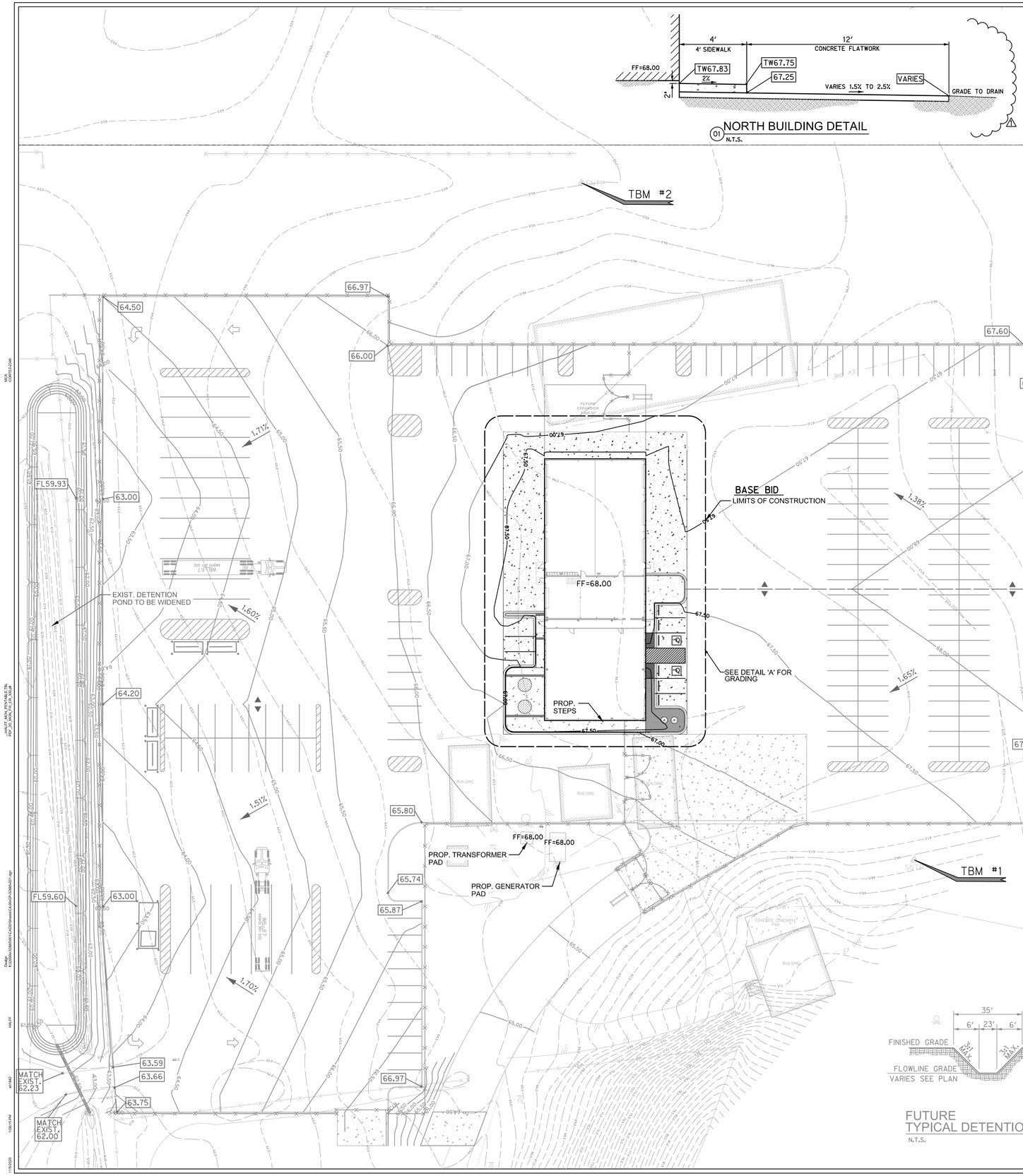
Revision No.	Date	Description
1	11/05/2020	Adjusted north side of Building

STATE OF TEXAS
RAUL GARCIA JR
94855
LICENSED PROFESSIONAL ENGINEER
11/5/20

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Issued:	MARCH 2019
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Checked By:	RG
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Sheet Title
PAVING & DIMENSIONAL CONTROL PLAN

C3.00
Sheet Number



LEGEND

PROPOSED	EXISTING	
■	CI □	INLET
▨	GI □	GRATE INLET
●	MH ○	MANHOLE
◔	WV ○	GATE VALVE & BOX
	WM ⊕	WATER METER
✠	FH ●	FIRE HYDRANT
	SSCO ○	SANITARY CLEAN OUT
	LP ⊙	LIGHT POLE
	EB □	ELECTRIC BOX
	PP ⊘	POWER POLE
	TPED □	TELEPHONE PEDESTAL
	—x—x—	FENCE
	TS ▽	TRAFFIC SIGN
	— EX OHE —	OVERHEAD ELECTRIC
	— EX UGE —	UNDERGROUND ELECTRIC
	— Ex GAS —	GAS LINE
	— Ex F/O —	FIBER OPTIC LINE
	— Ex TEL —	TELEPHONE LINE
		ASPHALT PAVEMENT
	-EX 6"SS-	SAN. SEWER
W	— EX 6"W —	WATER
FIRE	— Ex FIRE —	FIRE PROTECTION
	— 36"SD —	STORM SEWER
100.00	- - 100.00 - -	CONTOUR
→		DRAINAGE FLOW ARROW
+ TP100.00		TOP OF PAVEMENT
+ TC100.00		TOP OF CURB
+ G100.00		GUTTER
+ FL100.00		FLOW LINE
+ TW100.00		TOP OF WALK
+ 100.00		FINISHED GRADE
		ASPHALT PAVEMENT
		HEAVY DUTY CONCRETE
		LIGHT DUTY CONCRETE
		↓ CAUTION ↓ UTILITY CROSSING

GRADING NOTES:

1. ALL SPOT GRADES ARE FINISHED GRADE UNLESS OTHERWISE NOTED.

TBM #1
SET NAIL: SET ON TOP OF PAVEMENT ON THE SOUTH EAST CORNER OF THE SITE IMPROVEMENTS
ELEVATION = 68.87(NAVD88)
N=16604584.30
E=1170552.39
(NAD83)

TBM #2
SET NAIL: FOUND ON TOP OF PAVEMENT ON THE NORTH END OF THE SITE IMPROVEMENTS
ELEVATION = 65.07(NAVD88)
N=16604981.99
E=1170346.73
(NAD83)

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HIDALGO COUNTY PRECINCT ONE

HALFF
500 WEST MILITARY, SUITE 100
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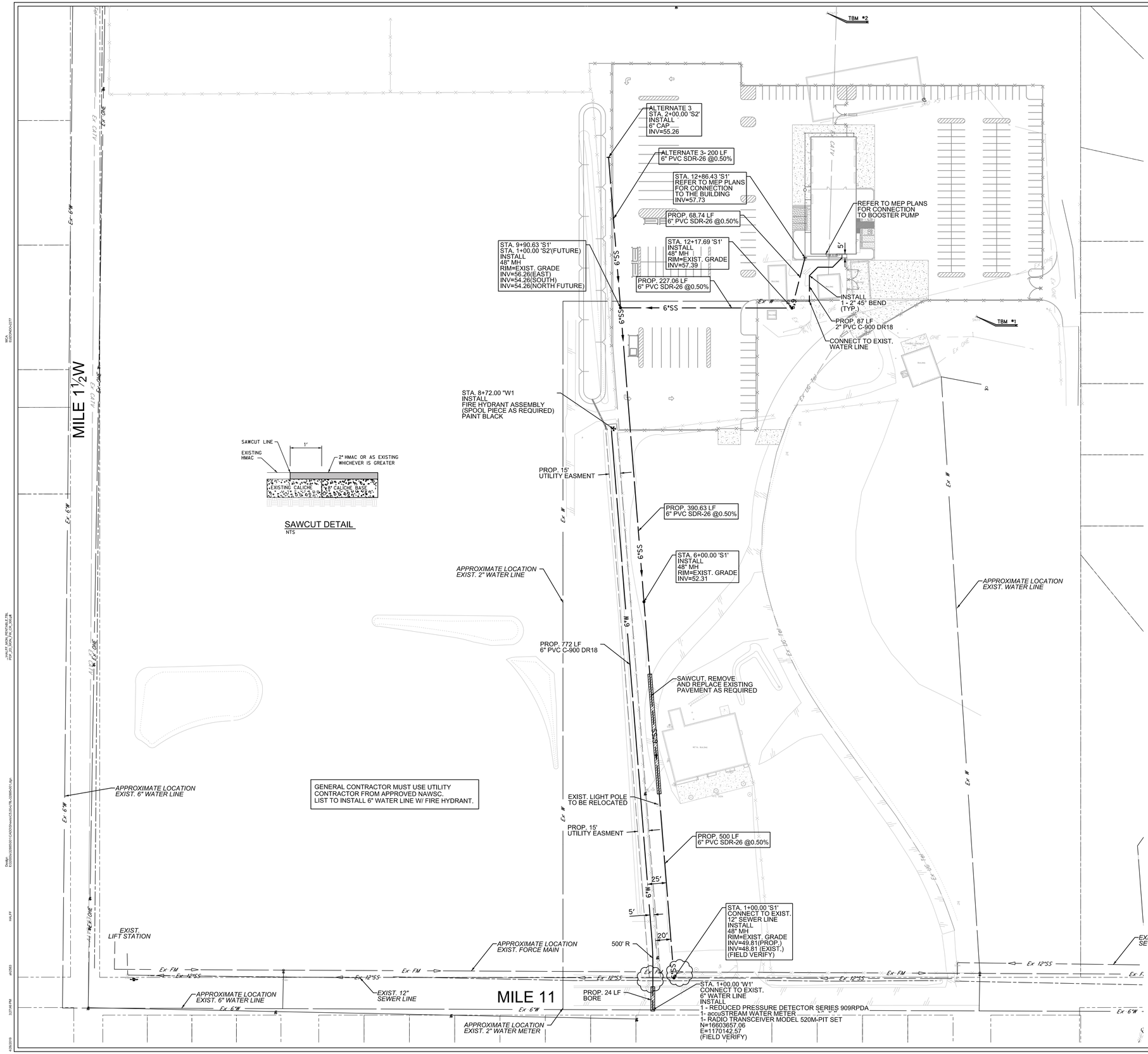
Revision No.	Date	Description
1	11/05/2020	Adjusted north side of Building

STATE OF TEXAS
RAUL GARCIA JR.
94855
LICENSED PROFESSIONAL ENGINEER
11/5/20

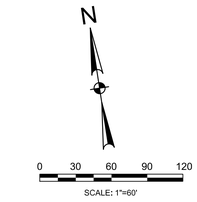
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Checked By:	RG
Scale:	AS NOTED

Sheet Title
GRADING PLAN

C4.00
Sheet Number



SAWCUT DETAIL
NTS



LEGEND

PROPOSED	EXISTING	
■	CI □	INLET
▨	GI □	GRATE INLET
●	MH ○	MANHOLE
	WV ○	GATE VALVE & BOX
	WM ⊕	WATER METER
✠	FH ●	FIRE HYDRANT
	SSCO ○	SANITARY CLEAN OUT
	LP ⊙	LIGHT POLE
	EB ⊡	ELECTRIC BOX
	PP ⊘	POWER POLE
	TPED □	TELEPHONE PEDESTAL
	—x—x—	FENCE
	TS ▽	TRAFFIC SIGN
	— EX OHE —	OVERHEAD ELECTRIC
	— EX UGE —	UNDERGROUND ELECTRIC
	— Ex GAS —	GAS LINE
	— Ex F/O —	FIBER OPTIC LINE
	— Ex TEL —	TELEPHONE LINE
		ASPHALT PAVEMENT
——→	—EX 6"SS—<—	SAN. SEWER
—W—	— EX 6"W —	WATER
—FIRE—	— Ex FIRE —	FIRE PROTECTION
	— 36"SD —	STORM SEWER
—100.00—	– – 100.00 – –	CONTOUR
——→		DRAINAGE FLOW ARROW
+ TP100.00		TOP OF PAVEMENT
+ TC100.00		TOP OF CURB
+ G100.00		GUTTER
+ FL100.00		FLOW LINE
+ TW100.00		TOP OF WALK
+ 100.00		FINISHED GRADE
▩		ASPHALT PAVEMENT
▨	▨	HEAVY DUTY CONCRETE
▨	▨	LIGHT DUTY CONCRETE
⌇		⌇ CAUTION ⌇ UTILITY CROSSING

TBM #1
SET NAIL: SET ON TOP OF PAVEMENT
ON THE SOUTH EAST CORNER OF THE
SITE IMPROVEMENTS
ELEVATION = 68.87(NAVD88)
N=16604584.30
E=1170552.39
(NAD83)

TBM #2
SET NAIL: FOUND ON TOP OF PAVEMENT
ON THE NORTH END OF THE
SITE IMPROVEMENTS
ELEVATION = 65.07(NAVD88)
N=16604981.99
E=1170346.73
(NAD83)

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HIDALGO COUNTY PRECINCT ONE

HALFF
500 WEST MILITARY, SUITE 100
MCALLEN, TX 78503
(956) 664-0288

Revision No.	Date	Description

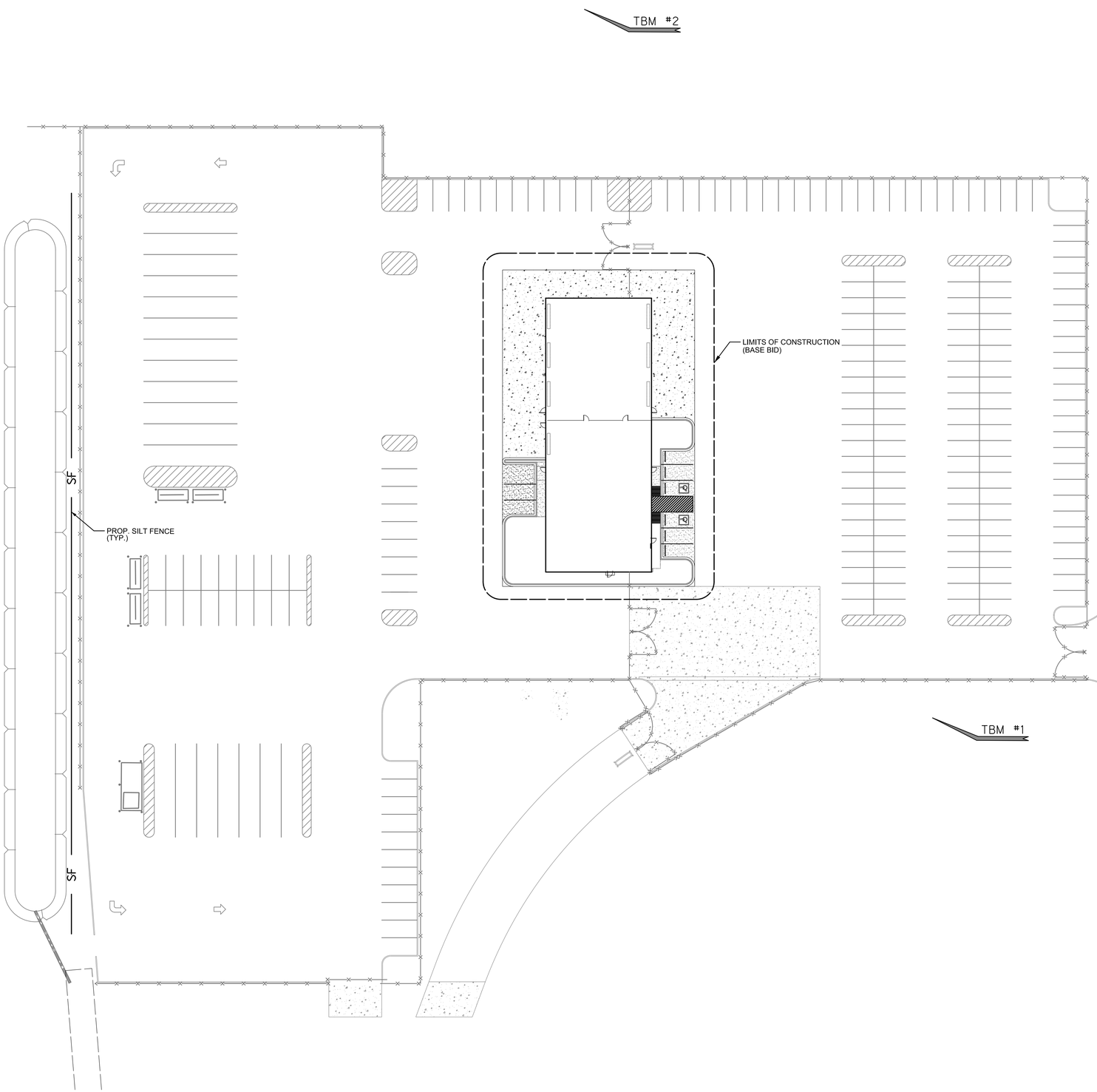
STATE OF TEXAS
RAUL GARCIA, JR.
94855
LICENSED
PROFESSIONAL ENGINEER
4/25/19

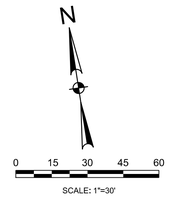
Project No.:	32885-001
Issued:	MARCH 2019
Drawn By:	FC
Checked By:	RG
Scale:	AS NOTED

Sheet Title
UTILITY PLAN

C5.00
Sheet Number

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3/29/2019





EROSION CONTROL LEGEND:

- CURB/GRATE INLET PROTECTION
- SF — SILT FENCE

NOTE: THIS IS NOT A STORM WATER POLLUTION PREVENTION PLAN. CONTRACTOR MUST ADD HIS OPERATION SPECIFIC INFORMATION PER THE PERMIT REQUIREMENTS & INCLUDE ALL DOCUMENTATION & CERTIFICATES AS REQUIRED BY THE PERMIT.

NOTE:
STABILIZED CONSTRUCTION EXIT LOCATION TO BE DETERMINED BY CONTRACTOR.

TBM #1
SET NAIL: SET ON TOP OF PAVEMENT ON THE SOUTH EAST CORNER OF THE SITE IMPROVEMENTS
ELEVATION = 68.87(NAVD88)
N=16604584.30
E=1170552.39
(NAD83)

TBM #2
SET NAIL: FOUND ON TOP OF PAVEMENT ON THE NORTH END OF THE SITE IMPROVEMENTS
ELEVATION = 65.07(NAVD88)
N=16604981.99
E=1170346.73
(NAD83)

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE

SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HIDALGO COUNTY PRECINCT ONE

HALFF
500 WEST 13TH STREET, SUITE 100
AUSTIN, TX 78701
(956) 664-0288

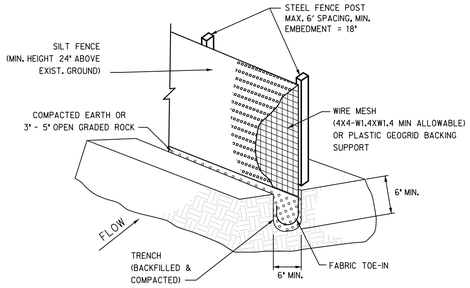
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94855
LICENSED PROFESSIONAL ENGINEER
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Sheet Title
SUGGESTED EROSION CONTROL PLAN

C6.00
Sheet Number



ISOMETRIC VIEW

SILT FENCE DETAIL

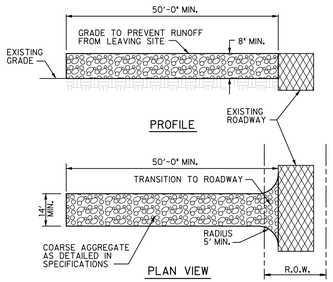
NTS

SILT FENCE NOTES:

1. STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED WITH A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF 18".
2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CANNOT BE TRENCHED IN WEIGHT FABRIC FLAP WITH WASHED GRAVEL ON UPHILL SIDE, AS NECESSARY, TO PREVENT FLOW UNDER FENCE.
3. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED.
4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH STEEL SUPPORT POST OR TO BACKING SUPPORT, WHICH IS IN TURN ATTACHED TO THE STEEL FENCE POST. FABRIC SHALL OVERLAP AT ABUTTING ENDS A MINIMUM OF 3 FEET AND SHALL BE JOINED SUCH THAT NO BYPASS OR LEAKAGE OCCURS.
5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL. REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES. THE SILT SHALL BE DISPOSED OF IN AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

NOTES:

1. STONE SHALL BE 3 TO 5 INCH DIAMETER CRUSHED ROCK OR ACCEPTABLE CRUSHED CEMENT CONCRETE
2. WHEN NECESSARY, VEHICLES SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO A PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WITH DRAINAGE FLOWING AWAY FROM BOTH THE STREET AN THE STABILIZED ENTRANCE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.
3. THE ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.
4. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED SURFACES. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE A CONDITIONS DEMAND. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PAVED SURFACES, MUST BE REMOVED IMMEDIATELY.
5. STABILIZED CONSTRUCTION EXIT TO BE REMOVED UPON COMPLETION OF CONSTRUCTION.



STABILIZED CONSTRUCTION EXIT

NTS

EROSION GENERAL NOTES

1. IT IS THE INTENT OF THIS SUGGESTED EROSION CONTROL PLAN AND WITHIN THE SPECIFICATIONS TO BE USED AS THE GENERAL GUIDELINES OF THE STORM WATER POLLUTION PREVENTION PLAN FOR THIS PROJECT TO ESTABLISH A MINIMUM BASIS OF COMPLIANCE WITH FEDERAL REGULATIONS. CONTRACTOR SHALL PREPARE AND SUBMIT A NOTICE OF INTENT PER THE REQUIREMENTS IN THE NPDES GENERAL PERMIT. THE CONTRACTOR SHALL PREPARE THE STORM WATER POLLUTION PREVENTION PLAN AND BE SOLELY RESPONSIBLE FOR ITS IMPLEMENTATION.
   THE STORM WATER POLLUTION PREVENTION PLAN SHALL MEET THE REQUIREMENTS SET FORTH IN THE TEXAS COMISSION ON ENVIRONMENTAL QUAILITY (TCEQ) TPDES GENERAL PERMIT FOR REGION 6 FOR STORM WATER DISCHARGES FROM CONSTRUCTION SITES.
2. THE STORM WATER POLLUTION PREVENTION PLAN SHOULD ADDRESS THREE GOALS:
   A) DIVERSION OF UPSLOPE WATER AROUND DISTURBED AREAS OF THE SITE;
   B) LIMITS THE EXPOSURE OF DISTURBED AREAS TO THE SHORTEST DURATION POSSIBLE; AND
   C) REMOVAL OF SEDIMENT FROM STORM WATER BEFORE IT LEAVES THE SITE.
3. THE CONTRACTOR SHALL MAKE THE STORM WATER POLLUTION PREVENTION PLAN AVAILABLE, UPON REQUEST, TO TCEQ.
4. THE CONTRACTOR MUST AMEND PLANS WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE OF THE PLAN, OR WHEN THE EXISTING PLAN PROVES INEFFECTIVE. MODIFICATIONS INCLUDING DESIGN AND ALL ADDITIONAL MATERIALS AND WORK SHALL BE ACCOMPLISHED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
5. STABILIZATION MEASURES ARE TO BE INSPECTED AT A MINIMUM OF ONCE EVERY 14 DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES. REPAIRS AND INADEQUACIES REVEALED BY THE INSPECTION MUST BE IMPLEMENTED WITHIN 7 CALENDAR DAYS FOLLOWING THE INSPECTION.
6. AN INSPECTION REPORT THAT SUMMARIZES INSPECTION ACTIVITIES AND IMPLEMENTATION OF THE STORM WATER POLLUTION PREVENTION PLAN SHALL BE RETAINED AND MADE PART OF THE PLAN.
7. ALL CONTRACTORS AND SUBCONTRACTORS IDENTIFIED IN THE PLAN MUST CERTIFY AS TO AN UNDERSTANDING OF THE NPDES GENERAL PERMIT BEFORE CONDUCTING ANY ACTIVITY IDENTIFIED IN THE POLLUTION PREVENTION PLAN.
8. THE CONTRACTOR SHALL ADOPT APPROPRIATE CONSTRUCTION SITE MANAGEMENT PRACTICES TO PREVENT THE DISCHARGE OF OILS, GREASE, PAINTS, GASOLINE, AND OTHER POLLUTANTS TO STORM WATER. APPROPRIATE PRACTICES CAN INCLUDE:

   DESIGNATING AREAS FOR EQUIPMENT MAINTENANCE AND REPAIR;
   REGULAR COLLECTION OF WASTE;
   CONVENIENTLY LOCATED WASTE RECEPTACLES; AND
   DESIGNATING AND CONTROLLING EQUIPMENT WASHDOWN.
9. THE CONTRACTOR SHALL AMEND OR MODIFY THIS PLAN AS REQUIRED BY CONSTRUCTION MEANS, METHODS AND SEQUENCE. MODIFICATIONS SHALL NOT COMPROMISE THE INTENT OF THE REQUIREMENTS OF LAW AND THIS PLAN. MODIFICATIONS SHALL NOT BE BASIS FOR ADDITIONAL COST TO THE OWNER.
10. AREAS OF CONSTRUCTION ELSEWHERE ON THE JOB SITE SHALL CONFORM TO THE DETAILS SHOWN ON THE PLANS.
11. BORROW AREAS, IF EXCAVATED, SHALL BE PROTECTED AND STABILIZED UTILIZING THE PLAN DETAILS. ALL WORK SHALL CONFORM TO GOVERNMENTAL REQUIREMENTS AND BECOME PART OF THE STORM WATER POLLUTION PREVENTION PLAN (SWP3). THE WORK SHALL BE DONE BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
12. ALL NON-PAVED AREAS SHALL BE MULCHED AND SEEDED WITH EROSION PROTECTION IMMEDIATELY UPON COMPLETION OF FINAL GRADING. THIS INCLUDES ALL DITCHES AND EMBANKMENTS. THE CONTRACTOR SHALL MAINTAIN FINAL GRADING AND KEEP SEEDED AREAS WATERED UNTIL FULLY ESTABLISHED AND ACCEPTED BY THE OWNER.
13. THE CONTRACTOR SHALL CONSTRUCT A STABILIZED CONSTRUCTION EXIT AT ALL TRAFFIC EXIT POINTS PRIOR TO EXITING ONTO ANY PAVED ROADWAY.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
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(956) 664-0288

Revision No.	Date	Description

STATE OF TEXAS
RAUL GARCIA JR.
94855
LICENSED PROFESSIONAL ENGINEER
4/26/19

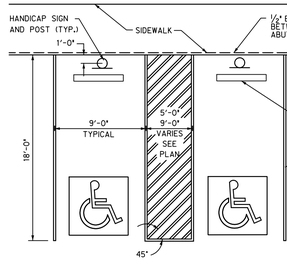
Project No.:	32885-001
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Checked By:	RG
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Sheet Title

SUGGESTED EROSION CONTROL PLAN DETAILS

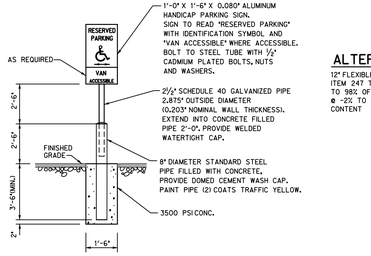
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HANDICAP SIGN & SUPPORT

NTS



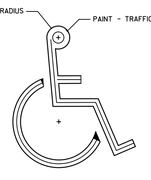
NOTES:

1. ALL SIGNS AND MARKINGS SHALL BE PLACED BY THE CONTRACTOR IN ACCORDANCE WITH THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, UNLESS OTHERWISE SHOWN OR DIRECTED.

* 2. INSTALL HEADER CURB WHEN SIDEWALK IS ADJACENT TO ASHPHALT PAVEMENT.

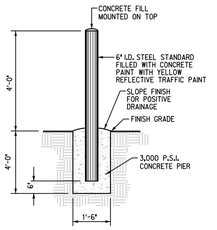
TYPICAL HANDICAP PARKING SPACE DETAIL

NTS



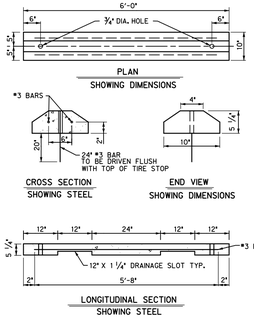
HANDICAP PARKING SYMBOL

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BOLLARD DETAIL

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NOTE: ALL CONCRETE SHALL BE CLASS A.

CONCRETE WHEEL STOP WITH DRAINAGE SLOTS DETAIL

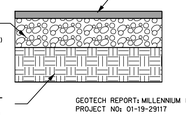
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ALTERNATE 3

12" FLEXIBLE BASE CONFORMING TO TXDOT ITEM 247 TYPE E , GRADE 3 COMPACTED TO 98% OF MAX. DRY DENSITY (ASTM D698) @ -2% TO +2% OF OPTIMUM MOISTURE CONTENT

ALTERNATE 3

10" CEMENT TREATED SUBGRADE (3% CEMENT) COMPACTED TO 95% OF MAX. DRY DENSITY (ASTM D698) @ -2% TO +2% OF OPTIMUM MOISTURE CONTENT

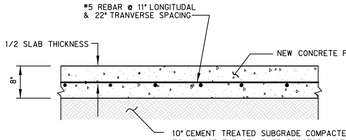


GEOTECH REPORT: MILLENNIUM ENGINEERS GROUP, INC.
PROJECT NO: 01-19-29117

* THIS IS AN ESTIMATED RATE FOR BIDDING PURPOSES. THE ACTUAL PERCENTAGE OF CEMENT REQUIRED SHOULD BE DETERMINED BY APPROPRIATE LABORATORY TESTING AT THE TIME OF CONSTRUCTION.

ASPHALT PAVEMENT SECTION

NTS



GEOTECH REPORT: MILLENNIUM ENGINEERS GROUP, INC.
PROJECT NO: 01-19-29117

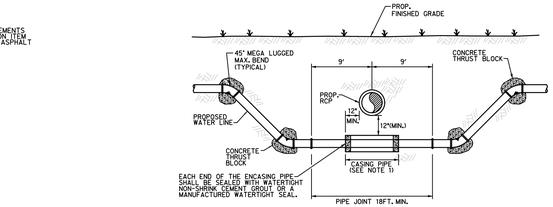
PAVEMENT SECTION:

CONCRETE MIN. 4,000 PSI @28 DAYS
CONTRACTOR TO CUT 15' x 15' CONTROL JOINTS.
EXPANSION JOINTS NOT TO EXCEED 75 FT.

CONTRACTOR TO USE 7/8" DIAMETER DOWELS 42" LONG @ 24" ON CENTER ON NEW CONSTRUCTION
EXPANSION AND LONGITUDINAL JOINTS

HEAVY DUTY CONCRETE PAVEMENT

NTS

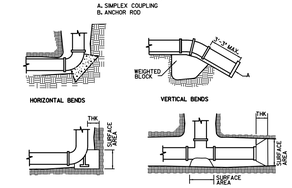


NOTES:

1. CASING PIPE TO BE 20" (MIN.) PVC C-900 DR18. REFER TO HWWS CASING & SKIDS DETAIL ON SHEET C12.1

TYPICAL WATER DEFLECTION

NTS



GENERAL NOTES

1. SEE THRUST BLOCK SIZE CHART FOR PROPER THICKNESS AND SURFACE AREAS. (SHEET 2 OF 2)

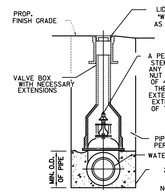
2. THE LOCATION OF THRUST BLOCKS DEPENDS UPON THE DIRECTION OF THRUST AND TYPE FITTINGS.

THRUST BLOCK SIZE

DIAMETER OF PIPE INCHES	HORIZONTAL BEND SURFACE AREA SQ. FEET	THICKNESS INCHES	WEIGHT AT VERTICAL BENDS-LBS.
22-1/2° BENDS			
6 OR LESS	2	8	1700
8	3	8	3,000
10	3.5	12	4,500
12	4	14	6,600
14	5	18	9,000
16	6	18	11,800
45° BENDS			
6 OR LESS	4	12	3,200
8	5	14	5,800
10	6	18	9,000
12	7	18	13,000
14	8	24	17,000
16	11.5	24	23,200
90° BENDS			
6 OR LESS	6	12	6,000
8	8	15	10,700
10	10	18	15,700
12	12	18	24,000
14	18	24	32,600
16	21	24	42,700
TEES & DEAD ENDS			
6 OR LESS	3	12	
8	4	15	
10	6	18	
12	8.5	18	
14	11.5	24	
16	15	24	

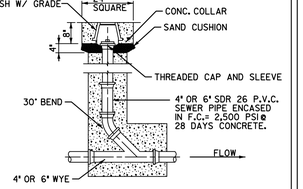
TYPICAL THRUST BLOCK DETAILS

NTS



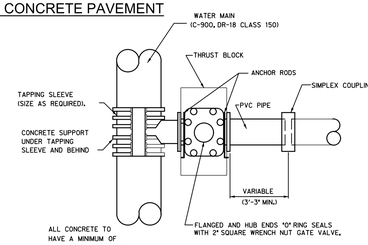
GATE VALVE AND BOX

NTS



TYPICAL CLEANOUT DETAIL

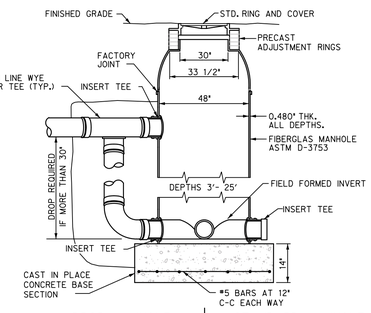
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ALL CONCRETE TO HAVE A MINIMUM OF 28 DAYS COMPRESSIVE STRENTH OF 3,000 P.S.I.

TAPPING SLEEVES & VALVE INSTALLATION

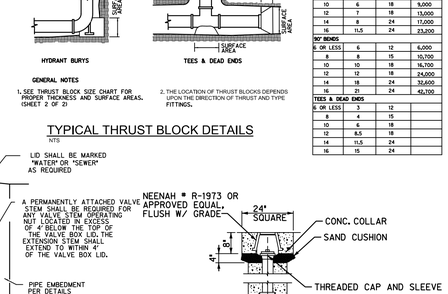
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DROP MANHOLE + STANDARD MANHOLE

TYPICAL FIBERGLASS MANHOLE

NTS



A. SAND OR SANDY LOAM BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE, (MIN. THICKNESS= 6")

B. SAND OR SANDY LOAM BACKFILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE, (4" LIFTS, HAND TAMPED) Bd TRENCH WIDTHS SHALL BE PIPE O.D. + 12" OR IN ACCORDANCE WITH ASTM 2321 FOR PVC PIPE.

C. SAND OR SANDY LOAM BACKFILL PLACED FROM SPRING LINE OF PIPE TO 6" ABOVE TOP OF PIPE, (6"-LIFTS, HAND TAMPED)

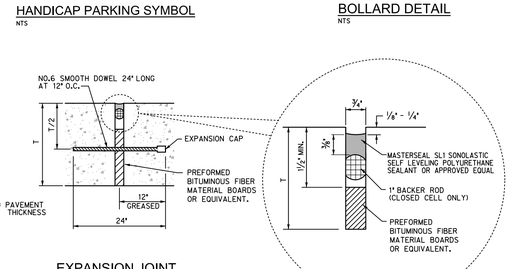
D-1. (CITY STREETS, PARKING AREA, SELECT EXCAVATED BACKFILL MATERIAL COMPACTED TO 95% SPD, (8" LIFTS, MECHANICAL COMPACTION)

D-2. (STATE MAINTAINED ROADWAY) COMPACTED SAND/CEMENT STABILIZED BACKFILL WITH 7% PORTLAND CEMENT COMPACTED AS PER ASTM D-4253 AND ASTM D-698.

E. SELECT EARTH BACKFILL COMPACTED TO 92% SPD, (12" LIFTS, MECHANICAL COMPACTION) FOUNDATION PREPARATION (WELLPOINTS, GRAVEL OR CEMENT STABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE. BACKFILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENT, AND COMPACTED TO 95% STD. PROCTOR DENSITY (USE RELATIVE DENSITY TEST PER ASTM D-4253 & ASTM D-698). THE THICKNESS OF EACH LOOSE LAYER SHALL NOT EXCEED 6". STRUCTURAL BACKFILL MATERIAL SHALL BE SAND, APPROVED SITE SOIL, OR OTHER APPROVED SUBSTITUTE.

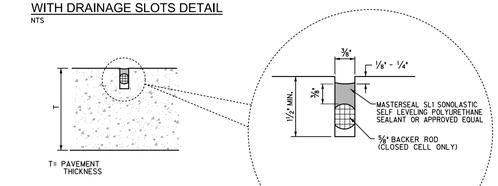
SANITARY SEWER BEDDING

NTS



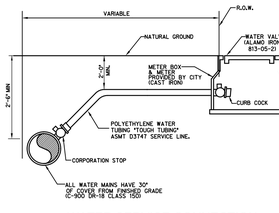
EXPANSION JOINT

NTS



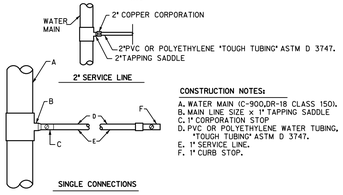
SAWED CONTRACTION JOINT

NTS



WATER SERVICE CONNECTION

NTS

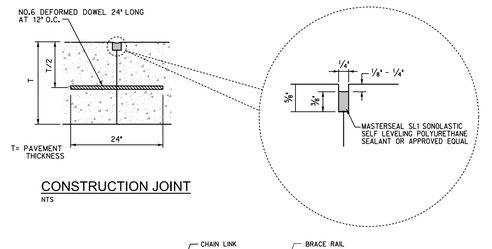


CONSTRUCTION NOTES:

A. WATER MAIN (C-900,DR-18 CLASS 150).
B. MAIN LINE SIZE x 1" TAPPING SADDLE
C. 1" CORPORATION STOP
D. PVC OR POLYETHYLENE WATER TUBING, "TOUGH TUBING" ASTM D 3747.
E. 1" SERVICE LINE.
F. 1" CURB STOP.

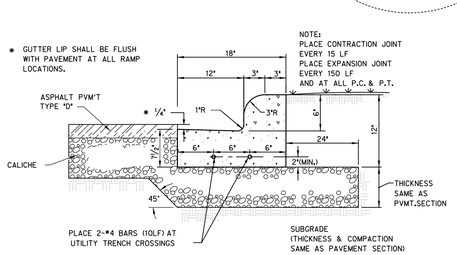
TYPICAL SINGLE SERVICE CONNECTION

NTS



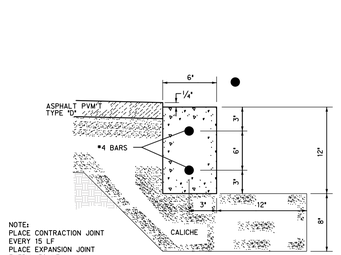
CONSTRUCTION JOINT

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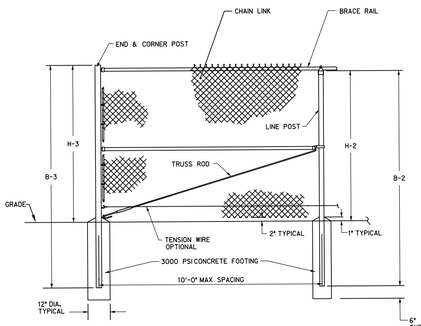
TYPICAL CURB AND GUTTER SECTION

NTS



TYPICAL HEADER CURB SECTION

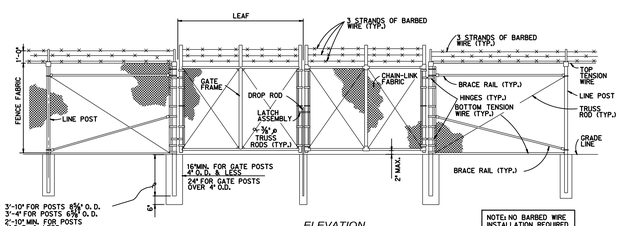
NTS



FENCE HEIGHT	UPRIGHT END & CORNER POSTS		LINE POSTS	
	H-1 NOMINAL HEIGHT	B-1 BAR LENGTH	H-1 HEIGHT ABOVE GRADE	B-2 BAR LENGTH	H-2 HEIGHT ABOVE GRADE
8'-0"	11'-0"	8'-5⅝"	10'-8"	7'-8⅝"

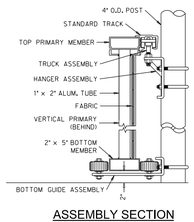
FENCE SECTION ELEVATION

NTS



DOUBLE SWING GATE (MANUAL)

NTS



ASSEMBLY SECTION

NTS

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE

SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
500 WEST MILITARY, SUITE 100
MCALLEN, TX 78503
(956) 664-0288

Revision No.	Date	Description

STATE OF TEXAS
RAUL GARCIA JR.
94855
LICENSED PROFESSIONAL ENGINEER
4/26/19

Project No.:	32885-001
Issued:	MARCH 2019
Drawn By:	FC
Checked By:	RG
Scale:	AS NOTED

Sheet Title

MISCELLANEOUS DETAILS

C8.00

Sheet Number

GENERAL NOTES

GENERAL

1. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. UNLESS OTHERWISE INDICATED, THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE, WORKMEN, AND OTHER PERSONS DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO BRACING, SHORING FOR CONSTRUCTION EQUIPMENT, SHORING FOR THE BUILDING, SHORING FOR THE EARTH BANKS, FORMS, SCAFFOLDING, PLANNING, SAFETY NETS, SUPPORT AND BRACING FOR CRANES, GIN POLES, ETC. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK, AND HE SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE ARCHITECT OR THE ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.

2. IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW ALL APPLICABLE SAFETY CODES AND REGULATIONS DURING ALL PHASES OF CONSTRUCTION.

3. EQUIPMENT FRAMING LOADS, OPENINGS AND STRUCTURE IN ANY WAY RELATED TO HVAC, PLUMBING, OR ELECTRICAL REQUIREMENTS ARE SHOWN FOR BIDDING PURPOSES ONLY. EXACT WEIGHTS AND LOCATIONS OF MECHANICAL EQUIPMENT SHALL BE COORDINATED BY CONTRACTOR. IF THE FINAL LOCATION VARIES FROM THAT SHOWN ON THE PLANS, CONTRACTOR TO NOTIFY ARCHITECT AND ENGINEER FOR APPROVAL BEFORE INSTALLATION.

4. SHOULD ANY OF THE DETAILED INSTRUCTIONS SHOWN ON THE PLANS CONFLICT WITH THESE STRUCTURAL NOTES, THE SPECIFICATIONS, OR WITH EACH OTHER, THE STRICTEST PROVISION SHALL GOVERN.

5. THE GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE JOB SITE AND SHALL BE RESPONSIBLE FOR CONDITIONS OF ALL WORK AND MATERIALS.

6. THE CONTRACTOR SHALL REVIEW AND VERIFY ALL DIMENSIONS AND ELEVATIONS. CONTRACTOR SHALL REPORT ANY DISCREPANCIES IN WRITING TO THE ARCHITECT. ANY CONFLICT BETWEEN THE DRAWING AND SPECIFICATIONS OF THE VARIOUS TRADES INVOLVED SHALL BE REPORTED TO THE ARCHITECT AND ENGINEER.

7. DETAILS SHOWN ON DRAWINGS APPLY AT SIMILAR CONDITIONS.

8. ALL WORK SHALL BE DONE IN ACCORDANCE WITH LOCAL STANDARDS AND TO ALL APPLICABLE PROVISIONS OF THE GOVERNING BUILDING CODE.

9. THE ARCHITECT AND ENGINEER SHALL BE NOTIFIED IN WRITING WHEN WORK COMMENCES.

10. CONTRACTOR SUBSTITUTIONS: ANY MATERIALS OR PRODUCTS THAT ARE SUBMITTED FOR APPROVAL THAT ARE DIFFERENT FROM THE MATERIALS OR PRODUCTS SPECIFIED IN THE CONTRACT DOCUMENTS WILL ONLY BE CONSIDERED IF THE FOLLOWING CRITERIA ARE SATISFIED.
    A) A COST SAVING TO THE OWNER IS DOCUMENTED AND SUBMITTED WITH THE REQUEST
    B) THE MATERIAL OR PRODUCT HAS BEEN APPROVED BY THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO) AND THE ICBO REPORT IS SUBMITTED WITH THE REQUEST.

STRUCTURAL OBSERVATION

1. THE PROFESSIONAL ENGINEER OR HIS/HER AUTHORIZED REPRESENTATIVE SHALL CONDUCT ALL STRUCTURAL OBSERVATIONS. STRUCTURAL OBSERVATIONS SHALL BE FOR THE PURPOSE OF ASCERTAINING GENERAL COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS. HOWEVER, SUCH OBSERVATION VISITS SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OBLIGATIONS AND RESPONSIBILITIES TO THE CONSTRUCTION DOCUMENTS.

2. ITEMS THAT REQUIRE A STRUCTURAL OBSERVATION ARE AS FOLLOWS:
    A. STEEL REINFORCEMENT IN SLAB OR FOUNDATION
    B. FRAMING OF SECOND FLOOR BEFORE DECKING IS INSTALLED
    C. SECOND FLOOR DECKING
    D. FRAMING OF ROOF STRUCTURE BEFORE METAL PANELS ARE INSTALLED
    E. METAL PANEL INSTALLATION

3. NOTIFY ENGINEER 24 HOURS IN ADVANCE WHEN A STRUCTURAL OBSERVATION IS REQUIRED.

4. WORK SHALL NOT CONTINUE AT THESE AREAS UNTIL OBSERVATION AND APPROVAL BY ENGINEER. FAILURE BY THE CONTRACTOR TO PROVIDE PROPER NOTICE FOR AN OBSERVATION VISIT AT THE REQUIRED TIME OR ADDITIONAL WORK PERFORMED WITHOUT AN OBSERVATION VISIT WILL BE DONE AT CONTRACTOR'S RISK AND MAY BE SUBJECT TO COMPLETE OR PARTIAL REMOVAL TO VERIFY COMPLIANCE OF PREVIOUS WORK.

SHOP DRAWINGS & SUBMITTALS

1. SUBMITTAL THAT WILL BE REQUIRED FOR APPROVAL INCLUDE:
    A. CONCRETE MIX DESIGN
    B. CURING COMPOUND FOR CONCRETE
    C. REINFORCING STEEL
    D. STRUCTURAL STEEL
    E. STEEL JOIST
    F. METAL DECKING

2. DEFERRED SUBMITTALS THAT WILL REQUIRE APPROVAL INCLUDE:
    A. PRE-ENGINEERED BUILDING CALCULATIONS (INCLUDING REACTIONS)
    B. PRE-ENGINEERED CANOPIES (INCLUDING REACTIONS)

3. DEFERRED SUBMITTALS SHALL BE DESIGNED BY A TEXAS REGISTERED PROFESSIONAL ENGINEER ACCORDING TO THE DESIGN CRITERIA STATED IN THE PLANS AND SPECIFICATIONS THE SUBMITTAL SHALL INCLUDE SIGNED AND SEALED CALCULATIONS.

4. ALLOW (2) WEEKS MINIMUM FOR REVIEW OF SHOP DRAWINGS.

5. PRIOR TO ISSUING THE SUBMITTALS TO THE ENGINEER, THE CONTRACTOR SHALL REVIEW THE SHOP DRAWINGS. CONTRACTOR MUST VERIFY ALL DIMENSION WITH ARCHITECTURAL PLANS.

6. REVIEW OF SHOP DRAWINGS BY THE ENGINEER IS FOR GENERAL CONFORMANCE TO THE STRUCTURAL DRAWINGS. APPROVAL OF THE SHOP DRAWINGS BY THE ENGINEER DOES NOT RELIEVE THE CONTRACTOR FOR ANY ERRORS IN DIMENSIONS OR MATERIAL INDICATED ON THE SHOP DRAWINGS.

CONTRACTOR NOTE

THE STRUCTURAL SYSTEM FOR THIS PROJECT SHALL NOT BE CONSTRUCTED BY USING THE STRUCTURAL DRAWINGS ALONE. THESE DRAWINGS WERE DEVELOPED FROM DATA DERIVED PRIMARILY FROM THE ARCHITECTURAL DRAWINGS AND SECONDARILY FROM MEP, CIVIL AND OTHER DISCIPLINES' DOCUMENTS. IT IS INTENDED THAT CONSTRUCTION PROCEED BY UTILIZING ALL OF THE INFORMATION CONTAINED IN THE ENTIRE SET OF CONSTRUCTION DOCUMENTS TAKEN AS A WHOLE; FAILURE TO DO SO WILL RESULT IN ERRORS WHICH SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

DESIGN CRITERIA

1. DESIGN LOADS, STRUCTURAL ANALYSIS AND PREPARATION OF STRUCTURAL MEMBERS ARE BASED ON THE FOLLOWING CRITERIA:

2. CODE: ..... IBC 2018

3. VERTICAL LOADS
    A. ROOF DEAD LOAD (PRE-ENGINEERED BUILDING): ..... STRUCTURE SELF WEIGHT
    B. ROOF DEAD LOAD (CANOPIES): .....5 PSF
    C. COLLATERAL LOAD (PRE-ENGINEERED BUILDING): .....10 PSF
    D. FLOOR DEAD LOAD: .....62.5 PSF
    E. ROOF LIVE LOAD(REDUCIBLE) : .....20 PSF
    F. FLOOR LIVE LOAD: .....125 PSF
    G. UPLIFT LOAD .....SEE ROOF UPLIFT PLAN

    H. MECHANICAL LOAD:
    THE GENERAL CONTRACTOR SHALL SUBMIT ACTUAL WEIGHTS AND LOCATIONS OF EQUIPMENT TO BE USED IN THE PROJECT TO THE STRUCTURAL ENGINEER FOR VERIFICATION OF LOADS USED IN THE DESIGN AT LEAST TWO WEEKS PRIOR TO FABRICATION AND CONSTRUCTION OF THE SUPPORTING STRUCTURE.

4. LATERAL LOADS
    A. WIND SPEED (V-ULT): ..... 136 MPH
    WIND SPEED (V-ASD) ..... 105 MPH
    B. EXPOSURE CATEGORY: C
    C. IMPORTANCE FACTOR: 1.0
    D. BUILDING CATEGORY: II
    E. SEISMIC DESIGN CATEGORY: ..... A
    F. SITE CLASS: ..... D

5. GEOTECHNICAL ENGINEERING REPORT:
    PROVIDED BY: L & G CONSULTING ENGINEER, INC.
    PROJECT NUMBER: GL15016B
    DATED: 10/30/15
    FOUNDATION DESIGN BASED ON THE FOLLOWING PARAMETERS
    A. EFFECTIVE PI: 28
    B. CLIMATIC RATING (Cw): 15
    C. MINIMUM BEAM DEPTH: ..... 36 IN
    D. MINIMUM BEAM WIDTH: ..... 12 IN
    E. ALLOWABLE BEARING CAPACITY (BEAMS) ..... 1200 PSF
    F. ALLOWABLE BEARING CAPACITY (FOOTING) ..... 1400 PSF
    G. EXISTING PVR: ..... 2.2 - 2.4 IN
    H. PVR (SEE EXCAVATION NOTES): ..... 1 INCH

STRUCTURAL STEEL

1. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE TO AISC SPECIFICATIONS.

2. MATERIALS USED SHALL BE AS FOLLOWS=
    A. STRUCTURAL W-SHAPES - ASTM A992 GRADE 50
    B. STRUCTURAL M-SHAPES AND S-SHAPES - ASTM A36
    C. STRUCTURAL T-SHAPES - CUT FROM W-SHAPES
    D. CHANNELS AND ANGLES - ASTM A36
    E. ROUND HOLLOW STRUCTURAL SECTIONS - ASTM A500 GRADE B
    F. SQUARE AND RECTANGULAR HOLLOW STRUCTURAL SECTIONS - ASTM A500 GRADE B
    G. STRUCTURAL PLATES - ASTM A36
    H. STRUCTURAL BARS - ASTM A36
    I. HIGH STRENGTH BOLTS - ASTM A325
    J. ELECTRODES - SERIES E70

3. ALL WELDING SHALL BE DONE BY CERTIFIED WELDERS IN ACCORDANCE WITH THE LATEST EDITION OF THE AMERICAN WELDING SOCIETY SPECIFICATIONS.

4. CONNECTIONS NOT DETAILED AND/OR SCHEDULED ON STRUCTURAL DRAWINGS SHALL BE DETAILED BY FABRICATOR AND MARKED FOR ENGINEERS APPROVAL. CONNECTIONS TO BE DESIGNED TO AISC SPECIFICATIONS AND SHALL BE CAPABLE OF SUPPORTING 55% OF THE MAXIMUM UNIFORM LOAD CAPACITY FOR THE SPAN SPECIFIED, SHOWN IN THE TABLES OF UNIFORM CONSTANTS OF THE AISC MANUAL OF STEEL CONSTRUCTION.

5. REFER TO ARCHITECTURAL PLANS FOR ANY MISCELLANEOUS STEEL NOT SHOWN ON STRUCTURE DRAWING. MISCELLANEOUS STEEL AND CONNECTIONS SHALL BE DESIGNED BY STEEL FABRICATOR.

6. HOT DIP GALVANIZE, IN ACCORDANCE WITH ASTM A123 AND ASTM A153, STRUCTURAL STEEL AND FASTENERS PERMANENTLY EXPOSED TO THE WEATHER.

7. STEEL SUPPORTING OR CONNECTED TO HVAC AND OTHER EQUIPMENT AS SHOWN ON THE DRAWINGS IS SHOWN FOR BIDDING PURPOSES ONLY CONTRACTOR SHALL COORDINATE EXACT LOCATION AND SIZE BEFORE COMMENCING WORK.

8. STRUCTURAL STEEL SHALL BE PAINTED WITH ONE COAT OF RUST INHIBITIVE PAINT.

9. STRUCTURAL DRAWINGS SHALL NOT BE REPRODUCED IN WHOLE OR IN PART FOR SHOP DRAWING SUBMITTALS.

10. PROVIDE 4 TONS OF RED IRON ALLOWANCE TO BE USED AS DIRECTED BY STRUCTURAL ENGINEER. INCLUDE LABOR COSTS IN THE ALLOWANCE. ANY UNUSED ALLOWANCE SHALL BE CREDITED BACK TO OWNER AT A COST OF $3500 PER TON.

11. ALL WELDED CONNECTION SHALL BE MADE WITH A 1/4" FILLET WELD U.N.O.

12. PROVIDE 1/2" GAP AT ALL PENETRATIONS THROUGH CMU WALL AND INFILL WITH ELASTOMERIC MATERIAL.

13. STEEL FABRICATOR SHALL BE CERTIFIED BY ONE OF THE FOLLOWING: AISC/ IBC/ IAS-ICC

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CONCRETE

1. ALL CONCRETE WORK SHALL BE EXECUTED IN ACCORDANCE WITH ACI 318 AND ACI 301 LATEST EDITION.

2. CEMENT SHALL CONFORM TO ASTM CI50 TYPE I AGGREGATE SHALL CONFORM TO ASTM C33.

3. CONCRETE SHALL HAVE A MINIMUM 28 DAYS COMPRESSIVE STRENGTH AS FOLLOWS:

MEMBER TYPE	STRENGTH	SLUMP	MAX AGG.
FOUNDATION AND SLAB	3000 PSI	4"-6"	1.5 IN.

4. INSTALL 10 MIL VAPOR RETARDER UNDER SLABS ON GRADE AND ALONG SIDE OF TRENCHES IN ACCORDANCE WITH ASTM E1643. LAP JOINTS MINIMUM OF 12 INCHES.

5. PLACE CONCRETE CONTINUOUSLY BETWEEN PRE-DETERMINED EXPANSION AND CONSTRUCTION JOINTS.

6. ALL CONSTRUCTION JOINT LOCATIONS TO BE APPROVED BY ARCHITECT AND STRUCTURAL ENGINEER.

7. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE PERMITTED.

8. CURE CONCRETE IN ACCORDANCE WITH ACI 308.1

9. REFER TO ARCHITECTURAL AND MECHANICAL PLANS FOR LOCATIONS OF ALL DEPRESSIONS, OPENINGS, ACCESSORIES, ETC.

10. CONDUIT AND PLUMBING LINES SHALL BE PLACED BELOW SLAB REINFORCING AND SHALL BE NO BIGGER THAN 1 INCH.

11. FLYASH MAY BE USED TO REPLACE A PORTION OF THE PORTLAND CEMENT. THE RATIO OF FLYASH TO THE TOTAL OF THE FLYASH AND CEMENT IN A MIX SHALL NOT EXCEED 20%. FLYASH SHALL CONFORM TO ASTM C618, TYPE C OR F.

12. ALL FLOORS SHALL BE CONSTRUCTED WITH A MINIMUM FLATNESS FF = 35 AND A MINIMUM LEVELNESS OF FL = 25

13. CONTRACTION JOINTS TO BE INSTALLED WITHIN 12 HOURS OF POURING FOUNDATION.

14. TESTING OF CONCRETE SHALL BE DONE AS FOLLOWS:
    1) SETS SHALL CONSIST OF 3 CYLINDERS
    ONE TESTED AT 7 DAYS
    TWO TESTED AT 28 DAYS
    2) ONE SET SHALL BE TAKEN FOR EACH 150 CY AND FOR EVERY 5000 SF OF SURFACE AREA AND AT LEAST ONCE PER DAY OF POURING
    3) A MINIMUM OF 3 SETS SHALL BE TAKEN FOR EACH CLASS OF CONCRETE

15. NO WATER SHALL BE ADDED TO THE CONCRETE AT THE JOBSITE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE WITH THE CONCRETE SUPPLIER TO ENSURE A PUMPABLE AND WORKABLE MIX WITHOUT THE ADDITION OF WATER AT THE JOBSITE. THE USE OF PLASTICIZERS, RETARDANTS AND OTHER ADDITIVES SHALL BE AT THE OPTION OF THE CONTRACTOR SUBJECT TO THE APPROVAL OF THE STRUCTURAL ENGINEER. FOLLOW THE RECOMMENDATIONS OF THE MANUFACTURER FOR THE PROPER USE OF ADDITIVES. THE USE OF CALCIUM CHLORIDE OR OTHER CHLORIDE BEARING SALTS SHALL NOT BE PERMITTED.

16. PLACE CONCRETE IN A MANNER SO AS TO PREVENT SEGREGATION OF THE MIX. DELAY FLOATING AND TROWELING OPERATIONS UNTIL CONCRETE HAS LOST SURFACE WATER SHEEN OR ALL FREE WATER. DO NOT SPRINKLE FREE CEMENT ON THE SLAB SURFACE. FINISHING OF SLAB SURFACES SHALL COMPLY WITH THE RECOMMENDATIONS OF ACI 302.1 AND 304.

17. UNLESS SPECIFIED, CONCRETE MUST REACH THE FOLLOWING PERCENTAGES OF ITS 28-DAY COMPRESSIVE STRENGTH (F'c), BEFORE FORMS MAY BE REMOVED.

    WALL, COLUMNS, & BEAM SIDES.....40%
    JOIST PANS & BEAM BOTTOMS (IF RESHORED).....70%
    SHORING FOR FLOOR SYSTEMS (IF NOT RESHORED).....85%

18. NO CONCRETE SHALL BE PLACED OUTSIDE OF THESE SPECIFICATIONS WITHOUT THE OWNER'S PRIOR APPROVAL. ANY ITEMS NOT IN COMPLIANCE WITH THE OUTLINED SPECIFICATION SHALL BE REPORTED TO THE OWNER AND STRUCTURAL ENGINEER WITHIN 24 HOURS.

19. CONSTRUCTION VEHICLE LOADS SHALL NOT BE PERMITTED ON ELEVATED SLABS AT ANY TIME.

20. ALL RETAINING WALLS TO BE SHORED UNTIL UPPER SLAB IS IN PLACE AND HAS REACHED 70% OF ITS DESIGN STRENGTH OR THE RETAINING WALL HAS REACHED 100% OF ITS DESIGN STRENGTH. PROVIDE GRANULAR BACKFILL AND PERFORATED DRAIN PIPE CONNECTED TO SITE DRAINAGE, RE: CIVIL PLAN.

METAL FLOOR DECK

1. SHEET STEEL: ASTM A653 GRADE 33 STRUCTURAL QUALITY WITH G90 GALVANIZED COATING CONFORMING TO ASTM A525

2. DECK PROFILE - C
    PROFILE DEPTH - .6 IN.
    GAGE - 28

3. METAL DECK ATTACHMENT SHALL BE:
    AT SUPPORTS: #12 TEK SCREWS AT A 30/4 PATTERN
    AT SIDELAPS: #10 TEK SCREWS, 3 PER SPAN

4. WELDING OF METAL DECKING SHALL NOT BE ALLOWED

5. ALL METAL DECK PANELS SHALL SPAN ACROSS A MINIMUM OF FOUR JOISTS OR BEAMS

6. DECK ENDS SHALL BE LAPPED OVER SUPPORTS

7. CONCRETE TOPPING SHALL BE 3" NORMAL WEIGHT CONCRETE REINFORCED WITH 6x6 W2.1xW2.1 WWF

STEEL REINFORCING

1. ALL REINFORCEMENT SHALL BE NEW BILLET STEEL CONFORMING TO ASTM A-615 GRADE 60.

2. REINFORCING STEEL SHALL BE DESIGNED, DETAILED, FABRICATED AND PLACED IN ACCORDANCE WITH THE LATEST ACI DETAILING MANUAL (SP-66) AND CSRI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE, (ACI #315) LATEST EDITIONS.

3. BARS SCHEDULED OR DETAILED "CONT" SHALL BE SPLICED ONLY WHEN UNAVOIDABLE AT POINTS OF MINIMUM STRESS AND WITH A MINIMUM LAP AS FOLLOWS:
    A. HORIZONTAL BARS w/ MORE THAN 12' OF FRESH CONCRETE CAST BELOW LAPS.
    #6 BARS AND SMALLER - 57 BAR DIAMETERS
    #7 BARS AND BIGGER - 72 BAR DIAMETERS
    B. OTHER BARS
    #6 BARS AND SMALLER - 44 BAR DIAMETERS
    #7 BARS AND BIGGER - 55 BAR DIAMETERS
    C. ALL SPLICES TO BE STAGGERED A MINIMUM OF 4'-0". TOP BAR AND BOTTOM BAR SPLICES TO BE LOCATED AT MID-SPAN AND WITHIN 1/3 SPAN RESPECTIVELY.

4. CORNER REINFORCING BARS SHALL BE USED AT ALL CORNERS AND INTERSECTIONS.

5. EXTEND THE SLAB REINFORCING STEEL PERPENDICULAR TO EXTERIOR GRADE BEAM TO THE TOP OUT SIDE REINFORCING BAR OF BEAM.

6. SPACE REINFORCING BARS WITH MINIMUM CLEAR SPACING IN ACCORDANCE WITH ACI 318 OF ONE BAR DIAMETER, BUT NOT LESS THAN 1 INCH. FOR COMPRESSION MEMBERS, SPACE AT A MINIMUM OF 1.5 INCHES OR 1.5 BAR DIAMETERS, WHICHEVER IS GREATER.

7. WHERE REINFORCING BARS ARE PLACED IN MULTIPLE LAYERS, PLACE UPPER BARS DIRECTLY ABOVE LOWER BARS.

8. MAINTAIN CONCRETE COVER AROUND REINFORCEMENT IN ACCORDANCE WITH ACI 318 AND AS FOLLOWS:
    A. FOOTING AND CONCRETE CAST AGAINST EARTH - 3 INCHES
    B. EXPOSED TO EARTH OR WEATHER
    #6 BARS AND BIGGER - 2 INCHES
    #5 BARS AND SMALLER - 1.5 INCHES
    C. BEAMS AND COLUMNS - 1.5 INCHES
    D. SLABS AND WALLS - 1 INCH

9. REPAIR ANY DAMAGE TO VAPOR RETARDER PER MANUFACTURER SPECIFICATIONS.

10. ADDITIONAL REINFORCING TO BE PROVIDED ON SITE FOR USE AS DIRECTED BY STRUCTURAL ENGINEER.
    #4 BARS - 100 FT.
    #5 BARS - 100 FT.
    #6 BARS - 100 FT.

STEEL JOISTS

1. ALL STEEL JOISTS AND JOIST GIRDERS SHALL BE DETAILED, FABRICATED AND ERECTED PER AISC AND SJI SPECIFICATIONS FOR OPEN-WEB STEEL JOISTS.

2. STEEL JOISTS SHALL BE WELDED TO SUPPORTING MEMBERS UNLESS NOTED OTHERWISE.

3. JOIST BEARING SHALL BE A MINIMUM OF 2 1/2 INCHES WITH A MINIMUM 2 INCH LONG FILLET WELD EACH SIDE OF BEARING.

4. JOISTS AT COLUMN LOCATIONS OR CLOSEST JOIST TO COLUMN SHALL BE BOLTED.

5. PROVIDE BRIDGING IN ACCORDANCE WITH SJI SPECIFICATIONS. BRIDGING SHALL BE CONTINUOUS THROUGH STRUCTURAL STEEL MEMBERS, AND SHALL BE ANCHORED TO SPANDREL MEMBERS OR WALLS. PROVIDE ADDITIONAL BRIDGING WHERE REQUIRED FOR UPLIFT.

6. BOTTOM CHORD EXTENSIONS TO BE PROVIDED AS REQUIRED BY ARCHITECTURAL PLANS.

7. JOISTS SUPPORTING MECHANICAL UNITS TO BE DESIGNED FOR UNIT WEIGHT IN ADDITION TO GRAVITY LOADS SHOWN IN DESIGN CRITERIA.

8. REFER TO MECHANICAL ENGINEERING PLANS FOR EXACT UNIT WEIGHT AND LOCATIONS.

9. MECHANICAL EQUIPMENT SHALL BE SUPPORTED BY TOP CHORD OF JOIST ONLY.

10. PROVIDE SUPPORT ANGLES AROUND ANY OPENINGS IN ROOF DECK.

11. JOISTS AND ACCESSORIES SHALL BE PAINTED WITH ONE COAT OF RUST INHIBITIVE PAINT.

12. JOISTS TO BE DESIGNED PER LOADS SHOWN IN DESIGN CRITERIA.

13. DESIGN JOISTS FOR A 500 LB CONCENTRATED LOAD AT MIDSPAN TO ACT CONCURRENTLY WITH OTHER LOADS IN DESIGN CRITERIA.

14. JOIST MANUFACTURER SHALL DESIGN BOTTOM CHORDS OF ALL OPEN WEB JOISTS AND JOIST GIRDERS TO SUPPORT A 50 lb LOAD LOCATED ANYWHERE ALONG THE LENGTH OF THE CHORD.

15. HANGERS FOR MECHANICAL EQUIPMENT WITH REACTIONS IN EXCESS OF 50 lbs MUST BE LOCATED AT THE PANEL POINTS OF THE JOISTS. PROVIDE JOIST REINFORCING IN ACCORDANCE WITH THE TYPICAL DETAILS WHERE HANGERS ARE REQUIRED TO BE LOCATED MORE THAN 4 INCHES FROM THE JOIST PANEL POINTS.

16. PROVIDE FLAT BEARING FOR ALL JOISTS AND JOIST GIRDERS. BEAR JOISTS AND JOIST GIRDERS ON SUPPORTS IN ACCORDANCE WITH SJI SPECIFICATIONS.

17. PROVIDE 1/2" GAP AT ANY PENETRATIONS THROUGH CMU WALL AND INFILL WITH ELASTOMERIC MATERIAL.

18. STEEL JOISTS TO BE DESIGNED BY TEXAS REGISTERED PROFESSIONAL ENGINEER.

19. STEEL JOIST SHOP DRAWINGS SHALL BE SEALED BY A TEXAS REGISTERED PROFESSIONAL ENGINEER.

CHANIN ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com

STATE OF TEXAS
MIGUEL CHANIN
93127
LICENSED
PROFESSIONAL ENGINEER
11-6-20

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

- TX 78577
TEL: (956) -

HIDALGO COUNTY, PCT1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: —

DRAWING TITLE: GENERAL NOTES

FILE NAME:

JOB NO.: 18325

DATE: 11/06/2020

DRAWN BY: J.P./L.R./VDV

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GENERAL NOTES

PRE-ENGINEERED METAL BUILDING AND COMPONENTS

1. REFER TO SCHEMATIC ROOF FRAMING PLAN AND DESIGN CRITERIA FOR DESIGN LOAD REQUIREMENTS AND SPECIFICATIONS FOR THE PRE-ENGINEERED METAL BUILDING.
2. PRE-ENGINEERED METAL BUILDING MANUFACTURER SHALL SUBMIT DESIGN CERTIFICATION SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF TEXAS FOR THE STRUCTURAL FRAMING AND COVERING PANELS OF THE BUILDING SYSTEM. CERTIFICATION AND DESIGN SHALL MEET REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE (IBC) AND ASCE 7.
3. PRE-ENGINEERED METAL BUILDING MANUFACTURER CERTIFICATION SHALL BE SUBMITTED WITH SEALED SHOP DRAWINGS WHEN SUBMITTED FOR REVIEW.
4. SHOP DRAWINGS AND CALCULATIONS INCLUDING BUILDING REACTIONS, SHALL BE PREPARED AND REVIEWED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF TEXAS. SEALED SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED FOR REVIEW BY THE DESIGN TEAM.
5. ALL COMPONENTS SHALL BE DESIGNED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS AND STANDARDS OF THE AISC. THIS WORK SHALL INCLUDE ALL MEMBERS AND BRACES NECESSARY TO BRACE MASONRY WALLS. LIGHT GAGE STEEL MEMBERS SHALL COMPLY WITH THE LATEST ADDITION OF THE AISI.
6. PURLINS AND EAVE STRUTS SHALL HAVE A MINIMUM YIELD STRESS OF 55 KSI AND SHALL BE PAINTED WITH ONE COAT OF RED OXIDE OR APPROVED SHOP COAT.
7. PURLIN SPACING SHOWN IN STRUCTURAL DRAWINGS ARE FOR SCHEMATIC PURPOSES ONLY. PURLIN SPACING TO BE DETERMINED BY METAL BUILDING MANUFACTURER. PURLINS SHALL HAVE A MAXIMUM TOTAL LOAD DEFLECTION OF L/180.
8. SAG STRAPS SHALL BE LOCATED AS SHOWN ON PLANS AND SHALL BE FABRICATED WITH A MINIMUM YIELD STRENGTH OF 50 KSI.
9. STANDING SEAM METAL ROOF SHALL NOT BE CONSIDERED TO PROVIDE LATERAL BRACING FOR PURLINS. BRIDGING SHALL BE DESIGNED AND SUPPLIED BY THE METAL BUILDING MANUFACTURER TO RESIST BOTH GRAVITY AND UPLIFT LOADS.
10. CROSS BRACING SHALL BE DESIGNED AND SUPPLIED BY THE METAL BUILDING MANUFACTURER TO PROVIDE AN ADEQUATE HORIZONTAL ROOF DIAPHRAGM FOR THE STRUCTURE.
11. PROVIDE PINNED BASE CONNECTION FROM COLUMN TO FOUNDATION.
12. ALL ANCHOR BOLTS SIZES, LENGTH, AND EMBEDMENT SHALL BE DESIGNED BY THE METAL BUILDING MANUFACTURER AND SUPPLIED BY THE CONTRACTOR. ANCHOR BOLT EMBEDMENT DEPTHS SHALL BE DESIGNED TO RESIST CONCRETE CONICAL SHEAR FAILURE.
13. THIS FOUNDATION HAS BEEN DESIGNED USING ASSUMED REACTIONS FROM THE PRE-ENGINEERED METAL BUILDING COMPONENTS AND IS FOR BID PURPOSES ONLY. THE CONTRACTOR SHALL SUBMIT BASE CONNECTION DETAILS (SIZE AND THICKNESS OF BASE PLATE AND DIAMETER AND LENGTH OF ANCHOR BOLTS) AND REACTIONS SO THE DESIGN ASSUMPTIONS CAN BE VERIFIED.
14. ANY ADDITIONAL COST OF FOUNDATION WORK REQUIRED BY REVISIONS OF THE FOUNDATION DESIGN AFTER PRE-ENGINEERED METAL BUILDING REACTIONS ARE SUBMITTED SHALL NOT BE INCURRED BY STRUCTURAL ENGINEER.
15. DRIFT CRITERIA FOR RIGID FRAMES AND METAL GIRTS SHALL HAVE A MAXIMUM DEFLECTION OF H/240 FOR MASONRY FINISHES AND A H/120 FOR METAL SIDING.

STRUCTURAL TESTS AND SPECIAL INSPECTION

1. THE OWNER SHALL EMPLOY A SPECIAL INSPECTOR TO PROVIDE INSPECTIONS DURING CONSTRUCTION ON THE TYPES OF WORK LISTED IN THIS SECTION.
2. THE FOLLOWING TERMS AND PHRASES SHALL HAVE THE MEANINGS SHOWN BELOW AS IT PERTAINS TO THIS SECTION.
   A. APPROVED AGENCY - AN ESTABLISHED AND RECOGNIZED AGENCY REGULARLY ENGAGED IN CONDUCTING AND FURNISHING SPECIAL INSPECTION SERVICES.
   B. APPROVED FABRICATOR - AN ESTABLISHED AND QUALIFIED FIRM APPROVED BY BUILDING OFFICIAL. SPECIAL INSPECTIONS ARE NOT REQUIRED WHEN WORK IS PERFORMED ON THE PREMISES OF AN APPROVED FABRICATOR.
   C. SPECIAL INSPECTION, CONTINUOUS - THE FULL TIME OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION.
   D. SPECIAL INSPECTION, PERIODIC - THE PART TIME OR INTERMITTENT OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION.
3. SPECIAL INSPECTORS SHALL KEEP RECORDS OF ALL INSPECTIONS AND SHALL FURNISH REPORTS TO THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THE DISCREPANCIES ARE NOT CORRECTED THEY SHALL BE BROUGHT TO THE ATTENTION OF THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE.
4. THE FOLLOWING ITEMS REQUIRE SPECIAL INSPECTION.
5. SPECIAL INSPECTION FOR STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF AISC 360.

TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD	IBC REFERENCE
1. INSPECTION REINFORCEMENT, INCLUDING PRE-STRESSING TENDONS, AND VERIFY PLACEMENT.	——		ACI 318: CH. 20, 25.2, 25.3, 26.6.1 -26.6.3	1908.4
2. REINFORCING BAR WELDING: A. VERIFY WEDABILIY OF REINFORCING BARS OTHER THAN ASTM A706; B. INSPECT SINGLE-PASS FILLET WELDS, MAXIMUM 5/16"; AND C. INSPECT ALL OTHER WELDS.	——		AWS D1.4 ACI 318: 26.6.4	——
3. INSPECT ANCHORS CAST IN CONCRETE.	——		ACI 318: 17.8.2	——
4. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS. A. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS. B. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4.A.			ACI 318: 17.8.2.4 ACI 318: 17.8.2	——
5. VERIFYING USE OF REQUIRED DESIGN MIX.	——		ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.		——	ASTM C 172 ASTM C 31 ACI 318: 26.5, 26.12	1908.10
7. INSPECT CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.		——	ACI 318: 26.5	1908.6, 1908.7, 1908.8
8. VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	——		ACI 318: 26.5.3-26.5.5	1908.9
9. INSPECT PRESTRESSED CONCRETE FOR: a. APPLICATION OF PRESTRESSING FORCES; AND b. GROUTING OF BONDED PRESTRESSING TENDONS		—— ——	ACI 318: 26.10	——
10. INSPECT ERECTION OF PRECAST CONCRETE MEMBERS.	——		ACI 318: 26.9	——
11. VERIFY IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	——		ACI 318: 26.11.2	——
12. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	——		ACI 318: 26.11.1.2(b)	——

FOR SI: 1 INCH=24.5mm
a. WHERE APPLICABLE, SEE SECTION 1705.12, SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE.
b. SPECIFIC REQUIREMENTS FOR SPECIAL INSPECTION SHALL BE INCLUDED IN THE RESEARCH REPORT FOR ANCHOR ISSUED BY AN APPROVED SOURCE IN ACCORDANCE WITH 17.8.2 IN ACI 318, OR OTHER QUALIFICATION PROCEDURES. WHERE SPECIFIC REQUIREMENTS ARE NOT PROVIDED, SPECIAL INSPECTION REQUIREMENTS SHALL BE SPECIFIED BY THE REGISTERED DESIGN PROFESSIONAL AND SHALL BE APPROVED BY THE BUILDING OFFICIAL PRIOR TO THE COMMENCEMENT OF THE WORK.

TABLE 1705.2.3
REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. INSTALLATION OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS.		
a. END CONNECTIONS - WELDING OR BOLTED.	——	SJI SPECIFICATIONS LISTED IN SECTION 2207.1
b. BRIDGING - HORIZONTAL OR DIAGONAL.	——	
1. STANDARD BRIDGING	——	SJI SPECIFICATIONS LISTED IN SECTION 2207.1
2. BRIDGING THAT DIFFERS FROM THE SJI SPECIFICATIONS LISTED IN SECTION 2207.1.		

FOR S1: 1 INCH = 25.4 mm
a. WHERE APPLICABLE, SEE SECTION 1705.12, SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

TABLE 1705.6
REQUIRED VERIFICATION AND INSPECTION OF SOILS

VERIFICATION AND INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
1. VERIFY MATERIALS BELOW FOOTINGS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	——	X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	——	X
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	——	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	——
5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	——	X

REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

TYPE	CONTINUOUS	PERIODIC	REFERENCED STANDARD[a]	IBC REFERENCE
TABLE N5.4-1 INSPECTION TASKS PRIOR TO WELDING				
INSPECTION TASKS PRIOR TO WELDING	**QC**	**QA**	AISC SECT. N5	SECTIONS 1705.5, 2205, 2206, 2207, 2208, 2210, 2211
WELDING PROCEDURE SPECIFICATIONS (WPSs) AVAILABLE	P	P		
MANUFACTURER CERTIFICATIONS FOR WELDING CONSUMABLES AVAILABLE	P	P		
MATERIAL IDENTIFICATION (TYPE/GRADE)	P	P		
WELDING IDENTIFICATION SYSTEM[1]	P	P		
FIT-UP GROOVE WELDS (INCLUDING JOINT GEOMETRY) • JOINT PREPARATION • DIMENSIONS (ALIGNMENT, ROOT OPENING, ROOT FACE, BEVEL • CLEANLINESS (CONDITION OF STEEL SURFACES) • TACKING (TACK WELD QUALITY AND LOCATION) • BACKING TYPE AND FIT (IF APPLICABLE)	O	O		
CONFIGURATION AND FINISH OF ACCESS HOLES	O	O		
FIT-UP OF FILLET WELDS • DIMENSIONS (ALIGNMENT, GAPS OF ROOT • CLEANLINESS (CONDITION OF STEEL SURFACES) • TACKING (TACK WELD QUALITY AND LOCATION)	O	O		
CHECK WELDING EQUIPMENT	O	—		
TABLE N5.4-2 INSPECTION TASKS DURING WELDING				
INSPECTION TASKS DURING WELDING	**QC**	**QA**	AISC SECT. N5	SECTIONS 1705.5, 2205, 2206, 2207, 2208, 2210, 2211
USE OF QUALIFIED WELDERS	O	O		
CONTROL AND HANDLING OF WELDING CONSUMABLES • PACKAGING • EXPOSURE CONTROL	O	O		
NO WELDING OVER CRACKED TACK WELDS	O	O		
CONTROL AND HANDLING OF WELDING CONSUMABLES • WIND SPEED WITHIN LIMITS • PRECIPITATION AND TEMPERATURE	O	O		
WPS FOLLOWED • SETTING ON WELDING EQUIPMENT • TRAVEL SPEED • SELECTED WELDING MATERIALS • PREHEAT APPLIED • INTERPASS TEMPERATURE MAINTAINED (MIN./MAX.) • PROPER POSITION (F,V,H,OH.)	O	O		
WELDING TECHNIQUES • INTERPASS AND FINAL CLEANING • EACH PASS WITHIN PROFILE LIMITATIONS • EACH PASS MEETS QUALITY REQUIREMENTS	O	O		
TABLE N5.4-3 INSPECTION TASKS AFTER WELDING				
INSPECTION TASKS AFTER WELDING	**QC**	**QA**	AISC SECT. N5	SECTIONS 1705.5, 2205, 2206, 2207, 2208, 2210, 2211
WELDS CLEANED	O	O		
SIZE, LENGTH ANA LOCATION OF WELDS	P	P		
WELDS MEET VISUAL ACCEPTANCE CRITERIA • CRACK PROHIBITION • WELD/BASE-METAL FUSION • CRATER CROSS SECTION • WELD PROFILES • WELD SIZE • UNDERCUT • POROSITY	P	P		
ARC STRIKES	P	P		
K-AREA[1]	P	P		
BACKING REMOVAL AND WELD TABS REMOVED (IF REQUIRED)	P	P		
REPAIR ACTIVITIES	P	P		
DOCUMENT ACCEPTANCE OR REJECTION OF WELDED JOINT OR MEMBER	P	P		
TABLE N5.6-1 INSPECTION TASKS PRIOR TO BOLTING				
INSPECTION TASKS PRIOR TO BOLTING	**QC**	**QA**	AISC SECT. N5	SECTIONS 1705.5, 2205, 2206, 2207, 2208, 2210, 2211
MANUFACTURER'S CERTIFICATION AVAILABLE FOR FASTENER MATERIALS	O	P		
FASTENER MARKED IN ACCORDANCE WITH ASTM REQUIREMENTS	O	O		
PROPER FASTENERS SELECTED FOR THE JOINT DETAIL (GRADE, TYPE, BOLT LENGTH IF THREADS ARE TO BE EXCLUDED FROM SHEAR PLANE)	O	O		
PROPER BOLTING PROCEDURE SELECTED FOR JOINT DETAIL	O	O		
CONNECTING ELEMENTS, INCLUDING THE APPROPRIATE FAYING SURFACE CONDITION AND HOLE PREPARATION, IF SPECIFIED, MEET APPLICABLE REQUIREMENTS	O	O		
PRE-INSTALLATION VERIFICATION TESTING BY INSTALLATION PERSONNEL OBSERVED AND DOCUMENTED FOR FASTENER ASSEMBLIES AND METHODS USED	P	O		
PROPER STORAGE PROVIDED FOR BOLTS, NUTS, WASHERS AND OTHER FASTENER COMPONENTS	O	O		
TABLE N5.6-2 INSPECTION TASKS DURING BOLTING				
INSPECTION TASKS DURING BOLTING	**QC**	**QA**	AISC SECT. N5	SECTIONS 1705.5, 2205, 2206, 2207, 2208, 2210, 2211
FASTENER ASSEMBLES, OF SUITABLE CONDITION, PLACED IN ALL HOLES AND WASHERS (IF REQUIRED) ARE POSITIONED AS REQUIRED	O	O		
JOINT BROUGHT TO THE SNUG-TIGHT CONDITION PRIOR TO THE PRETENSIONING OPERATION	O	O		
FASTENER COMPONENT NOT TURNED BY THE WRENCH PREVENTED FROM ROTATING	O	O		
FASTENER ARE PRETENSIONED IN ACCORDANCE WITH THE RCSC SPECIFICATION, PROGRESSING SYSTEMATICALLY FROM THE MOST RIGID POINT TOWARD THE FREE EDGES	O	O		
TABLE N5.6-3 INSPECTION TASKS AFTER BOLTING				
INSPECTION TASKS AFTER BOLTING	**QC**	**QA**	AISC SECT. N5	SECTIONS 1705.2, 2205, 2206, 2207,2208, 2210, 2211
DOCUMENT ACCEPTANCE OR REJECTION OF BOLTED CONNECTIONS	P	P		
TABLE N6.1 INSPECTION OF STEEL ELEMENTS OF COMPOSITE CONSTRUCTION PRIOR TO CONCRETE PLACEMENT				
INSPECTION OF STEEL ELEMENTS OF COMPOSITE CONSTRUCTION PRIOR TO CONCRETE PLACEMENT	**QC**	**QA**	AISC SECT. N5	SECTIONS 1705.5, 2205, 2206, 2207, 2208, 2210, 2211
PLACEMENT AND INSTALLATION OF STEEL DECK	P	P		
PLACEMENT AND INSTALLATION OF STEEL HEADED STUD ANCHORS	P	P		
DOCUMENT ACCEPTANCE OR REJECTION OF STEEL ELEMENTS	P	P		

1. THE FABRICATOR OR ERECTOR AS APPLICABLE, SHALL MAINTAIN A SYSTEM BY WHICH A WELDER WHO HAS WELDED A JOINT OR MEMBER CAN BE IDENTIFIED. STAMPS IF USED, SHALL BE THE LOW-STRESS TYPE.
2. WHEN WELDING OF DOUBLE PLATES, CONTINUITY PLATES OR STIFFENERS HAS BEEN PREFORMED IN THE K-AREA , VISUALLY INSPECT THE WEB K-AREA FOR WITHIN 3 IN. (75m) OF THE WELD.
3. QC = QUALITY CONTROL
4. QA = QUALITY ASSURANCE
5. O = OBSERVE THESE ON A RANDOM BASIS. OPERATIONS NEED NOT TO DELAYED PENDING THESE INSPECTIONS.
6. P = PREFORM THESE TASKS FOR EACH WELD JOINT OR MEMBER.

CHANIN ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com

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ABBREVIATIONS

ABOVE FINISH FLOOR	A.F.F.
ADDITIONAL	ADDT'L
ADJACENT	ADJ.
AGGREGATE	AGGR.
ALTERNATE	ALT.
ANCHOR BOLT	A.B.
AND	&
ANGLE	∠
APPROXIMATE	APPROX.
ARCHITECT	ARCH.
ARCHITECTURAL	ARCH'L
AT	@
AIR CONDITIONER	A/C
AIR HANDLING UNIT	AHU
BACK FACE	B.F.
BACK TO BACK	B. TO B.
BASEMENT	BSMT.
BEAM	BM.
BELOW FINISH FLOOR	B.F.F.
BETWEEN	BTWN.
BLOCKING	BLKG.
BOUNDARY NAIL	B.N.
BOTTOM	BOTT.
BRACKET	BRKT.
BRIDGING	BRDG.
BRICK MASONRY UNIT	BMU
BUILDING	BLDG.
BUILDING LINE	B.L.
BASE PLATE	B.P.
CAST-IN-PLACE	C.I.P
CEILING	CLG.
CENTER LINE	CL
CENTER OF GRAVITY	C.G.
CLEAR OR CLEARANCE	CLR.
COLUMN	COL.
COMPRESSION	COMP.
CONCRETE	CONC.
CONCRETE MASONRY UNIT	CMU
CONNECTIONS	CONN(S)
CONTINUOUS	CONT.
CONTRACTOR	CONTR.
CONTROL JOINT	CONTR. JT.
CONSTRUCTION	CONST.
CONSTRUCTION JOINT	C.J.
COORDINATE	COORD.
COVER PLATE	COV. PL.
DEAD LOAD	DL
DEFORMED BAR ANCHOR	D.B.A.
DETAIL	DET.
DEVELOPMENT	DEV.
DIAGONAL	DIAG.
DIAMETER	DIA. OR Ø
DIMENSION(S)	DIM(S)
DRAWING(S)	DWG(S).
DOUBLE	DBL.
DOUGLAS FIR LARCH	D.F.L.
DOWEL(S)	DWL(S)
EACH	EA.
EACH FACE	E.F.
EACH WAY	E.W.
ELEVATION	ELEV.
ELECTRICAL	ELEC.
ENGINEER	ENGR.
EQUAL	EQ.
EQUIPMENT	EQUIP.
EXPANSION	EXP.
EXPANSION JOINT	E.J.
EXISTING	EXIST. OR (E)
EXTERIOR	EXT.
FABRICATOR	FABR.
FAR SIDE	F.S.
FIELD VERIFY	F.V.
FINISHED FLOOR	FIN. FLR.
FIREPROOF(ING)	FP.
FLANGE	FLG.
FLOOR	FL.
FLOOR DRAIN	F.D.
FOUNDATION	FDN.
FOOT OR FEET	FT.
FINISHED FLOOR ELEVATION	F.F.E.
GAGE OR GAUGE	GA.
GALVANIZED	GALV.
GRADE	GR.
GRADE BEAM	GR. BM.
HEADED CONCRETE ANCHORS	H.C.A.
HEADED STUDS	H.S.
HEIGHT	HT.
HIGH POINT	H.P.
HOLLOW STRUCTURAL SECTION	H.S.S.
HORIZONTAL	HORIZ. OR (H)
HOT DIP GALVANIZED	HDG
INCH	IN.
INFORMATION	INFO.
INSIDE DIAMETER	I.D.
INSIDE FACE	I.F.
INTERIOR	INT.
INTERMEDIATE	INTERM.
JOINT	JT.
JOIST(S)	JST(S)
KIPS(1000 lbs)	K
KIP PER LINEAR FOOT	KLF
KIP PER SQUARE FOOT	KSF
LIGHTWEIGHT	LWT.
LIVE LOAD	LL
LONGITUDINAL	LONG.
LONG LEG HORIZONTAL	LLH
LONG LEG VERTICAL	LLV
LOW POINT	L.P.
MANUFACTURE(R)	MFR.
MATERIAL	MAT'L.
MAXIMUM	MAX.
MECHANICAL	MECH.
MEZZANINE	MEZZ.
MIDDLE	MID.
MINIMUM	MIN.
MISCELLANEOUS	MISC.
MOMENT	M
MOMENT CONNECTION(S)	MC
NEAR FACE	N.F.
NOMINAL	NOM.
NON-SHRINK	N.S.
NOT IN CONTRACT	N.I.C.
NOT TO SCALE	N.T.S.
NUMBER	NO. OR #
ON CENTER	O.C.
OPENING(S)	OPNG(S)
OPPOSITE	OPP.
OPPOSITE HAND	O.H.
OUTSIDE FACE	O.F.
OUTSIDE DIAMETER	O.D.
PERPENDICULAR	PERP.
PLATE	PL.
POINT	PT.
POUNDS PER SQUARE FOOT	PSF
POUNDS PER SQUARE INCH	PSI
PRECAST CONCRETE	P/C
PREFABRICATED	PREFAB.
PRELIMINARY	PRELIM.
RADIUS	R
REINFORCED CONCRETE PIPE	RCP
REINFORCE, REINFORCING, REINFORCED, REINFORCEMENT	REINF.
REMAINDER	REM.
REQUIRE, REQUIRED	REQ., REQ'D
RETENTION	RET.
ROOF DRAIN	R.D.
ROOF TOP UNITS	R.T.U.
ROOM	RM.
ROUND	RND.
SCHEDULE(D)	SCHED.
SECTION	SECT.
SHEAR	V
SHEET	SHT.
SHEAR WALL	SW.
SIMILAR	SIM.
SLOPE DOWN	SL. DN.
SOUTHERN YELLOW PINE	S.Y.P.
SPACE	SP.
SPECIFICATION(S)	SPEC(S)
SPECIFIED	SPEC'D
SQUARE FOOT	S.F.
STAINLESS STEEL	S.S.
STANDARD	STD.
STEEL	STL.
STIFFENER	STIFF
STRAIGHT	STR.
STIRRUPS	STIR
STRUCTURE	STRUCT.
STRUCTURAL	STRUCT'L
SUBCONTRACTOR	SUBCONTR.
SYSTEM	SYS.
TEMPERATURE	TEMP.
TENSION	T
THICK	THK.
TONGUE AND GROOVE	T&G
TOP AND BOTTOM	T&B
TOP OF BEAM	T.O.B.
TOP OF BEARING	T.O.BRG.
TOP OF FOOTING	T.O.F.
TOP OF JOIST	T.O.J.
TOP OF MASONRY	T.O.M.
TOP OF PIER	T.O.P.
TOP OF PIERCAP	T.O.P.C.
TOP OF PLATE	T.O.PL.
TOP OF STEEL	T.O.S.
TOP OF STRUCTURAL CONCRETE	T.O.S.C.
TOP OF WALL	T.O.W.
TYPICAL	TYP.
UNLESS NOTED OTHERWISE	U.N.O.
VERTICAL	VERT. OR (V)
WATERSTOP	WS.
WELDED WIRE FABRIC	W.W.F.
WIND BRACE	WB
WIND LOAD	WL
WINDOW	WDW.
WITH	w/
WITHOUT	w/o
WORK POINT	W.P.
WOOD	WD.

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GENERAL NOTES

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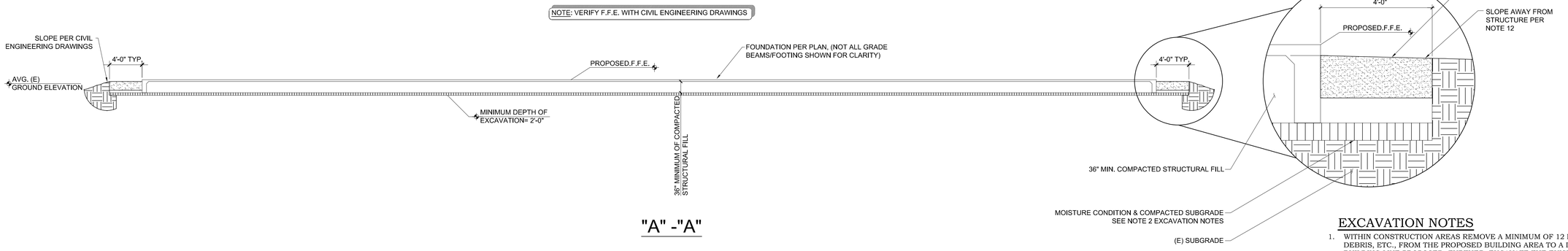
JOB NO.: 18325

DATE: 11/06/2020

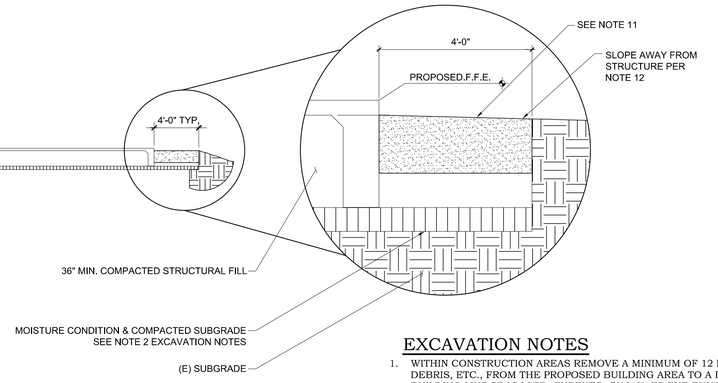
DRAWN BY: J.P./L.R./VDV

CHECKED BY: M.C.

SHEET: S103

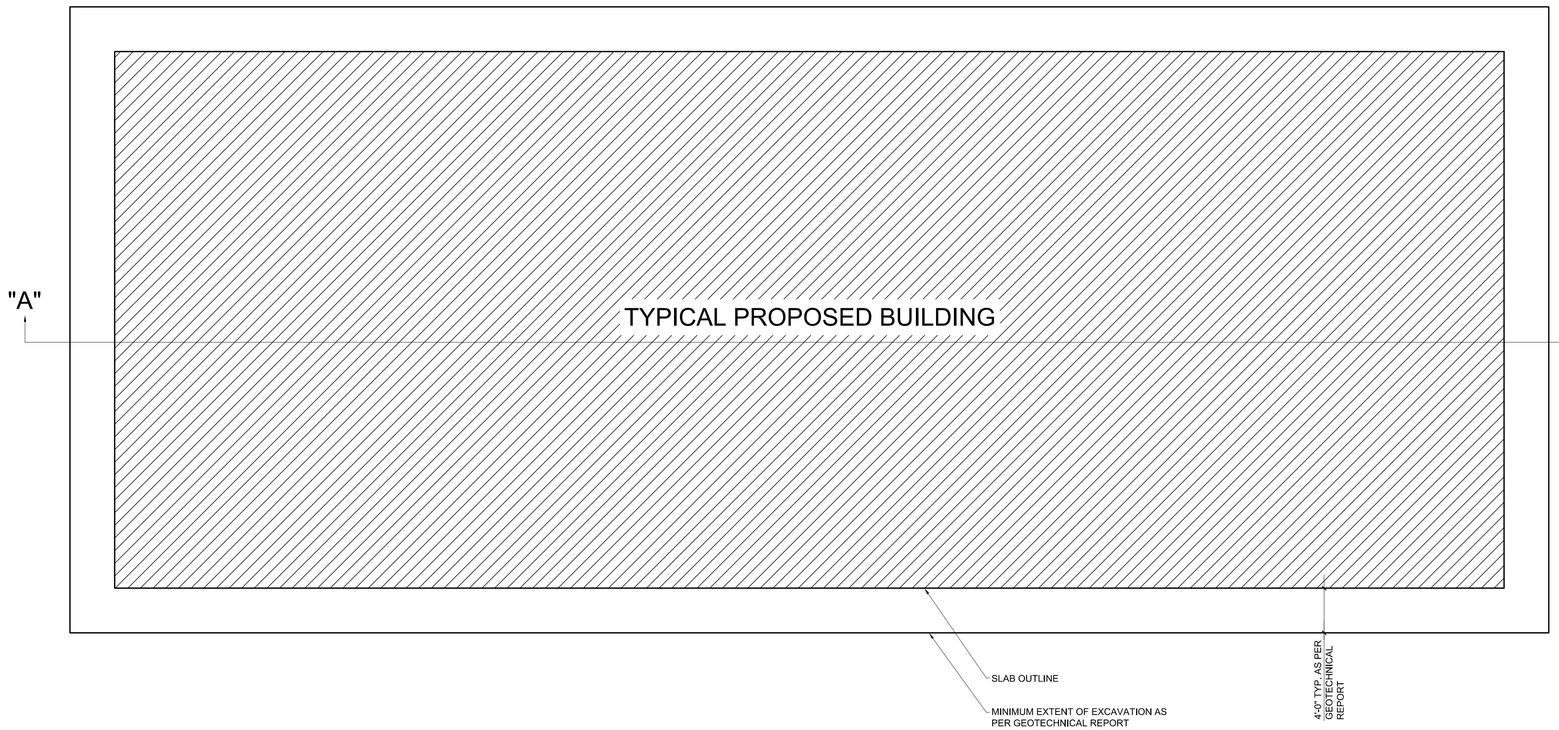


"A" -"A"



TYPICAL PROFILE

SCALE: NTS



PLAN NORTH

EXCAVATION PLAN

SCALE: NTS

EXCAVATION NOTES

1. WITHIN CONSTRUCTION AREAS REMOVE A MINIMUM OF 12 INCHES OF TOP SOIL, VEGETATION, DEBRIS, ETC., FROM THE PROPOSED BUILDING AREA TO A DISTANCE OF 4'-0" OUTSIDE THE BUILDING LINE PROPOSED. FURTHER, EXCAVATE THE EXISTING SUBGRADE SOILS DOWN TO A DEPTH OF 2'-0" BELOW EXISTING NATURAL GRADE.

2. EXPOSED SUBGRADE SHOULD BE MOISTURE CONDITIONED, COMPACTED, AND TESTED (MINIMUM. DEPTH OF 12') TO A RANGE OF OPTIMUM MOISTURE CONTENT TO +(3) PERCENTAGE POINTS. ABOVE OPTIMUM AND A MINIMUM 95% OF THE MAXIMUM DRY DENSITY, AS DETERMINED BY ASTM D-698. ANY SOFT AND/OR COMPRESSIBLE SOFT SPOTS NOTED DURING COMPACTIONS ACTIVITIES SHALL BE OVER-EXCAVATED AND REPLACED WITH SELECT FILL.

3. FILL BACK TO REQUIRED GRADE (A MINIMUM OF 36" OF STRUCTURAL FILL IS REQUIRED. REFER TO CIVIL PLANS FOR FINISHED FLOOR ELEVATION TO DETERMINE ADDITIONAL AMOUNT OF SELECT FILL NEEDED) WITH MATERIAL SELECTED AND COMPACTED IN ACCORDANCE WITH THE REQUIREMENTS BELOW.

4. MATERIALS USED FOR SELECT FILL SHALL MEET THE FOLLOWING REQUIREMENTS:

   A. SOILS CLASSIFIED ACCORDING TO USCS AS SM, SC, GM, GC, CL, ML, AND COMBINATIONS OF THESE SOILS. THE SOIL SHALL BE FREE OF ORGANIC MATTER. IN ADDITION TO THE USCS CLASSIFICATION, SELECTED MATERIALS SHALL HAVE A LIQUID LIMIT OF LESS THAN 40 AND PLASTICITY INDEX BETWEEN 8 AND 20.

   B. SOIL CLASSIFIED, AS CH, MH, OH, OL, AND PT, UNDER THE USCS ARE NOT CONSIDERED SUITABLE FOR USED AS SELECTED FILL MATERIALS AT THIS SITE.

   C. L & G RECOMMENDS ADDITIONAL QUALITY CONTROL OF ALL SITE FILL MATERIALS AS THEY ARE PLACED AND COMPACTED TO ENSURE THAT THEY MEET THE REQUIREMENTS SPECIFIED.

5. SELECTED FILL UNDER ALL FLOORS AND WALKS SHALL BE COMPACTED IN THE FIELD IN LIFTS NOT TO EXCEED 8" TO 95% OF THE MAXIMUM DENSITY, AT OR 3% ABOVE OF THE OPTIMUM MOISTURE CONTENT, AS DETERMINED BY TEST METHOD ASTM D-698.

6. MATERIALS USED FOR STRUCTURAL FILL SHALL MEET ONE OF THE FOLLOWING REQUIREMENTS OF TX DOT 2014 SPECIFICATION:

   A. ITEM 247 TYPE E, GRADE 4 - CALICHE

RETAINED ON SQUARE SIEVE	PERCENT RETAINED
2"	0
1/2"	20-60
NO. 4	40-75
NO. 40	70-90
PLASTICITY INDEX, MAX	15
WET BALL PI, MAX	15
WET BALL MILL, % MAX	50

   B. ITEM 247 TYPE A, GRADE 1- LIMESTONE

RETAINED ON SQUARE SIEVE	PERCENT RETAINED
2-1/2"	0
1-3/4"	0-10
7/8"	10-35
3/8"	30-65
NO. 4	45-75
NO. 40	65-90
PLASTIC LIMIT,% MAX	40
PLASTICITY INDEX, % MAX	10
WET BALL MILL, % MAX	40

7. STRUCTURAL FILL SHALL BE COMPACTED TO A MINIMUM 98 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE ASTM D698 AT MOISTURE CONTENTS RANGING BETWEEN -2% AND + 2% OF THE OPTIMUM MOISTURE CONTENT. FILL SHALL BE PLACED IN LOOSE LIFTS NOT TO EXCEED 8 INCHES. THE FILL SHOULD BE PROPERLY COMPACTED IN ACCORDANCE WITH THESE RECOMMENDATION AND TESTED FOR COMPACTION AS SPECIFIED.

8. SAMPLES OF PROPOSED SELECT FILL SHALL BE FURNISHED TO THE TESTING LABORATORY 7 DAYS PRIOR TO INSTALLATION TO PERMIT TIME FOR SPECIFICATION COMPLIANCE INSPECTION AND APPROVAL.

9. SITE PREPARATION TESTING SHALL BE AS FOLLOWS:
   A. ATTERBERG LIMITS OF SELECT FILL MATERIAL:
      (1) ONE TEST PER 5,000 CY

   B. COMPACTION TEST:
      TO BE PERFORMED PER LIFT ON TEST PER 3,000 SF MINIMUM
      OF (4) FOUR TEST PER LIFT

10. GEOTECHNICAL REPORT SHALL BE CONSIDERED A PART OF THE CONSTRUCTION DOCUMENTS. CONTRACTOR TO REVIEW AND COMPLY WITH ALL EARTHWORK AND GRADING REQUIREMENT IN GEOTECHNICAL REPORT.

11. IF 5' PERIMETER OVER EXCAVATION IS NOT COVERED BY CONCRETE FLATWORK, PROVIDE 2' THICK CLAY CAP IN OVER EXCAVATED ZONE. CLAY CAP SHALL CONSIST OF MATERIAL WITH P.I. RANGE OF 20-35.

12. FINAL SITE GRADING TO SLOPE AWAY FROM THE STRUCTURE AND SHALL PREVENT WATER FROM PONDING IN THE AREAS ADJACENT TO THE STRUCTURE FOR A MINIMUM DISTANCE OF 10'-0". ANY PONDING CLOSE TO THE STRUCTURE MAY CREATE VOLUMETRIC CHANGES IN THE SOIL AND MAY LEAD TO LESS THAN OPTIMUM PERFORMANCE OF THE BUILDING FOUNDATION.

13. IT IS ALSO IMPORTANT TO MINIMIZE CHANGES IN MOISTURE CONTENT CREATED BY ROOF DRAINAGE, PLUMBING LEAKS, LANDSCAPING / IRRIGATION, AND DOWNSPOUT OUTFALLS. ANY PLUMBING LEAKS SHALL BE REPAIRED AS SOON AS POSSIBLE AND PROPER DRAINAGE PROVIDED AWAY FROM THE BUILDING. LARGE BUSHES AND TREES SHALL NOT BE PLACED IN AREAS DIRECTLY ADJACENT TO THE FOUNDATION AS THEIR ROOT SYSTEM MAY CREATE SUBSTANTIAL MOISTURE DIFFERENTIALS THAT MAY LEAD TO VOLUME CHANGES IN THE SOIL. LARGE BUSHES AND TREES SHOULD BE LOCATED AT A REASONABLE DISTANCE FROM THE FOUNDATION.

CHANIN ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com
STATE OF TEXAS
MIGUEL CHANIN
93127
LICENSED PROFESSIONAL ENGINEER
11-6-20

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

- TX 78577
TEL: (956) -

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: —

DRAWING TITLE:
EXCAVATION PLAN

FILE NAME:

JOB NO.: 18325

DATE: 11/06/2020

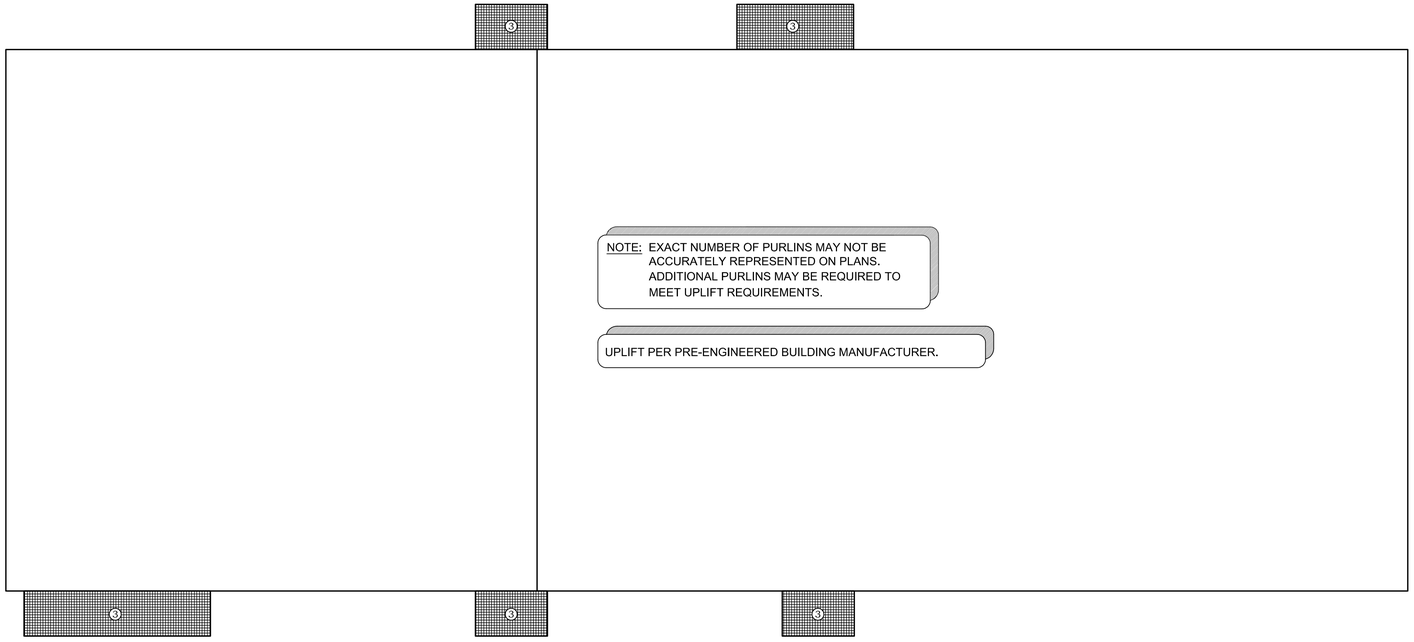
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CHECKED BY: M.C.

SHEET: S104

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ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com

STATE OF TEXAS
MIGUEL CHANIN
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NOTE: EXACT NUMBER OF PURLINS MAY NOT BE ACCURATELY REPRESENTED ON PLANS. ADDITIONAL PURLINS MAY BE REQUIRED TO MEET UPLIFT REQUIREMENTS.

UPLIFT PER PRE-ENGINEERED BUILDING MANUFACTURER.

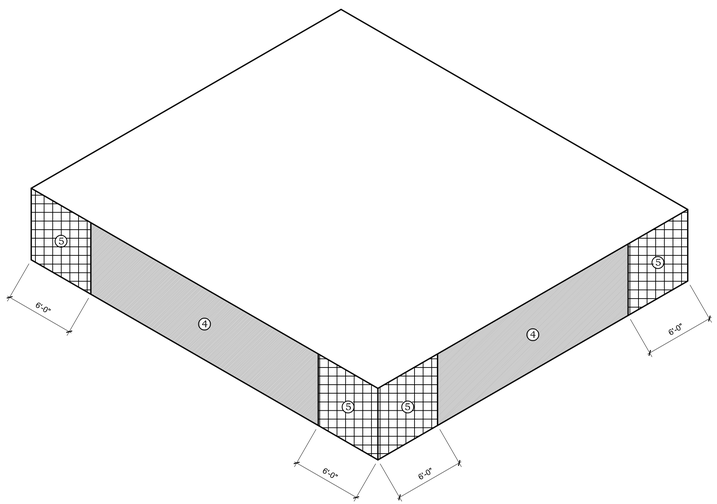
ALLOWABLE STRESS DESIGN

EFFECTIVE WIND AREA	ZONE	GROSS	NET
10	3	- 73.3 psf	- 67.3 psf
20	3	- 66.3 psf	- 60.3 psf
50	3	- 57.3 psf	- 51.3 psf

WIND LOAD PLAN NOTES:
1. NEGATIVE PRESSURES DENOTE FORCE ACTING AWAY FROM BUILDING SURFACE (SUCTION).
2. PRESSURES FOR TRIBUTARY AREAS IN BETWEEN THE LISTED VALUES MAY BE LINEARLY INTERPOLATED.

N
PLAN NORTH

ROOF UPLIFT PLAN
SCALE: NTS



ALLOWABLE STRESS DESIGN

EFFECTIVE WIND AREA	ZONE	MAX PRESSURE
10	4	± 27.7 psf
20	4	± 26.6 psf
50	4	± 25.0 psf
10	5	± 34.3 psf
20	5	± 32.0 psf
50	5	± 28.9 psf

WIND LOAD PLAN NOTES:
1. NEGATIVE PRESSURES DENOTE FORCE ACTING AWAY FROM BUILDING SURFACE (SUCTION).
2. PRESSURES FOR TRIBUTARY AREAS IN BETWEEN THE LISTED VALUES MAY BE LINEARLY INTERPOLATED.

COMPONENTS AND CLADDING
SCALE: NTS

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ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

- TX 78577
TEL: (956) -

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SUNSET PARK OPERATIONS FACILITY
.
MERCEDES, TEXAS

DATE: —

DRAWING TITLE:
EXCAVATION PLAN/COMPONENTS AND CLADDING

FILE NAME:

JOB NO.: 18325

DATE: 11/06/2020

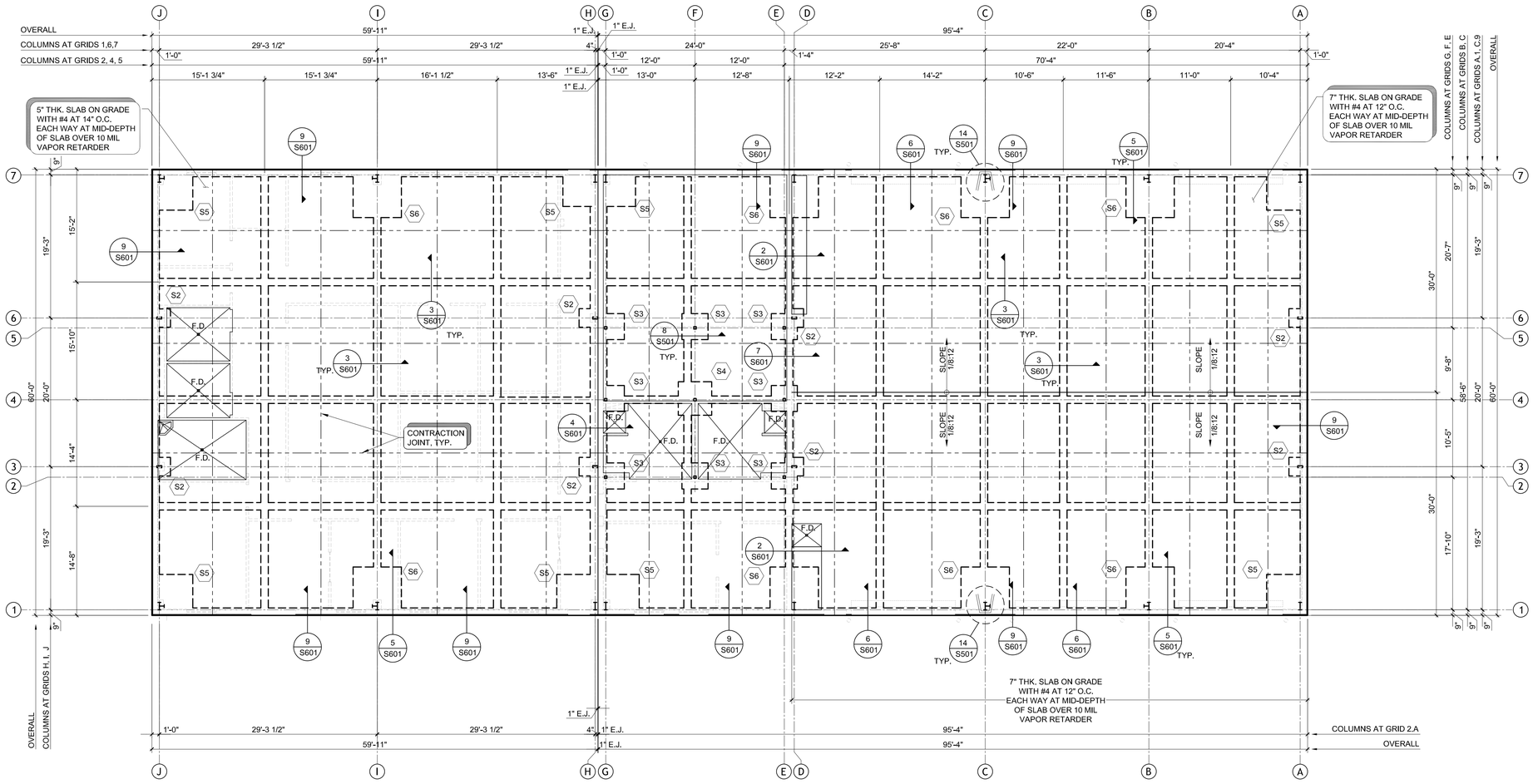
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SHEET: S105

CHANIN
ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com

STATE OF TEXAS
MIGUEL CHANIN
93127
LICENSED
PROFESSIONAL ENGINEER
11-6-20



FOUNDATION NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS WITH ARCHITECTURAL PLANS BEFORE COMMENCING WORK.
2. CONTRACTOR TO VERIFY LOCATION OF ANY/ALL DROPS AND DRAINS IN SLAB WITH ARCHITECTURAL DRAWINGS.
3. CONTRACTOR TO VERIFY REQUIRED F.F.E. WITH CIVIL ENGINEERING DRAWINGS.
4. REFER TO FOOTING SCHEDULE FOR FOOTING SIZE AND REINFORCEMENT, SEE DETAIL 7/S501.
5. FOR COLUMN SIZES REFER TO SHEET S301

PLAN NORTH

FOUNDATION PLAN

SCALE: 1/8"=1'-0"

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ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

- TX 78577
TEL: (956) -

DATE: —

DRAWING TITLE: FOUNDATION PLAN

FILE NAME:

JOB NO.: 18325

DATE: 11/06/2020

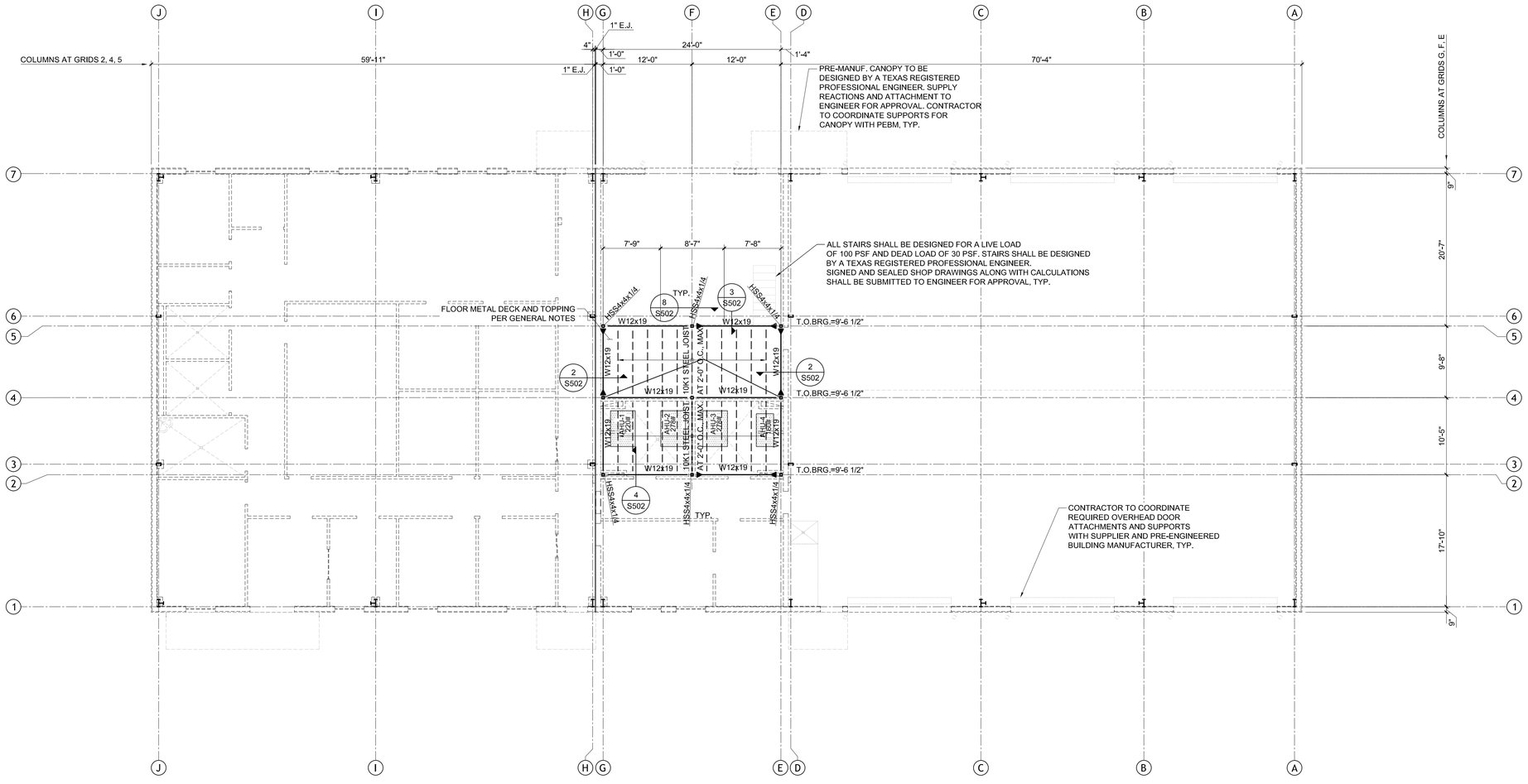
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CHECKED BY: M.C.

SHEET: S201

CHANIN
ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com

STATE OF TEXAS
MIGUEL CHANIN
93127
LICENSED
PROFESSIONAL ENGINEER
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MEZZANINE PLAN NOTES:

1. IF ANY DISCREPANCIES ARE FOUND BETWEEN THESE DRAWINGS AND THE ARCHITECTURAL DRAWINGS THE CONTRACTOR SHALL NOTIFY THE ARCHITECT AND ENGINEER BEFORE COMMENCING CONSTRUCTION.
2. ▶ INDICATES MOMENT CONNECTION, SEE DETAIL 5/S502.

PLAN NORTH

1 MEZZANINE PLAN
SCALE: 1/8"=1'-0"

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ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

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SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

- TX 78577
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DATE: —

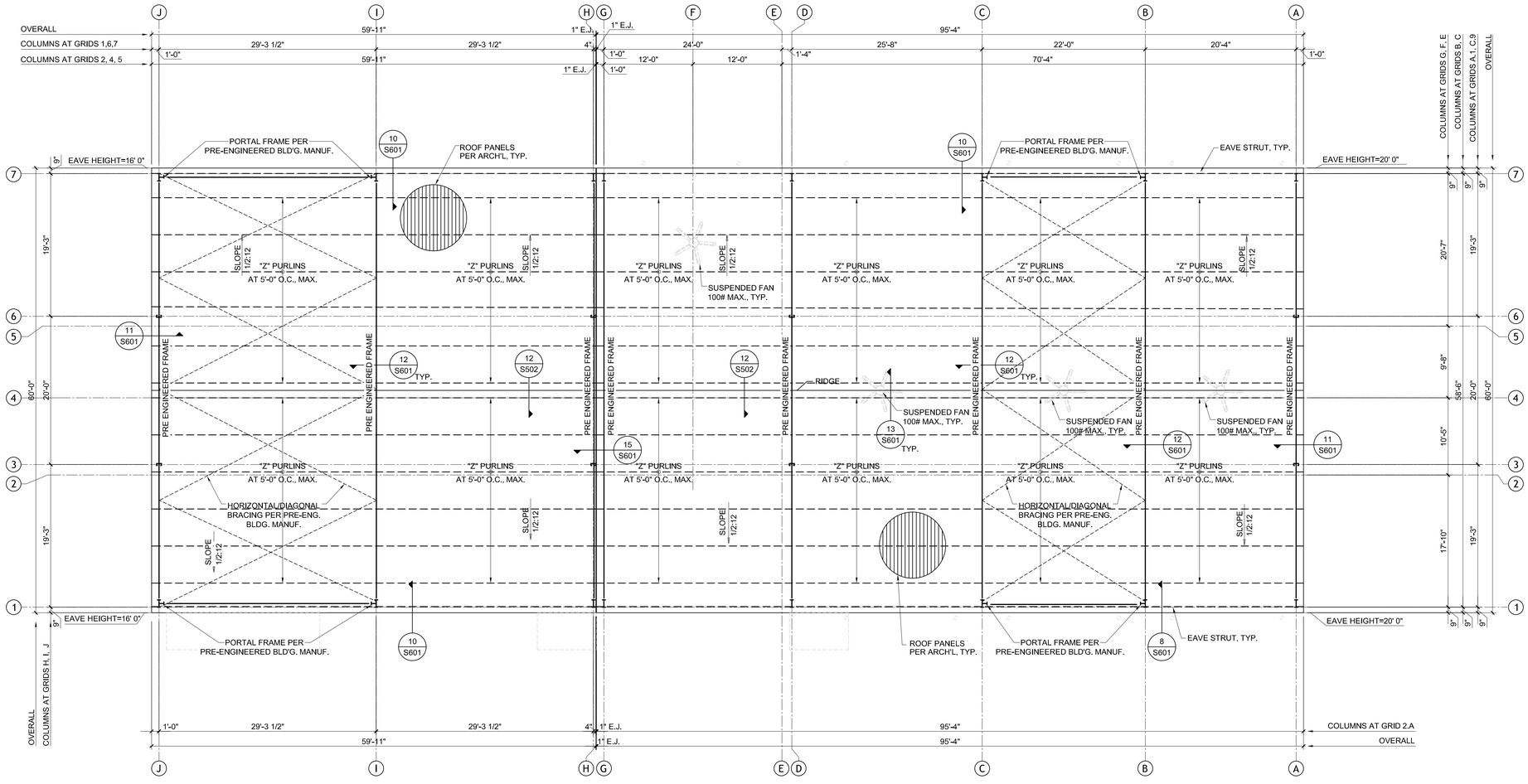
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FILE NAME:
JOB NO.: 18325
DATE: 11/06/2020
DRAWN BY: J.P./L.R./VDV
CHECKED BY: M.C.
SHEET: S301

CHANIN
ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com

STATE OF TEXAS
MIGUEL CHANIN
93127
LICENSED PROFESSIONAL ENGINEER
11-6-20

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307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259



NOTE:
CONTRACTOR TO CORDINATE EAVE HEIGHTS WITH ARCHITECTURAL DRAWINGS

NOTE:
PRE-ENGINEERED BUILDING MANUFACTURER TO COORDINATE LOCATIONS, WEIGHTS, AND ATTACHMENTS OF SUSPENDED MECHANICAL EQUIPMENT.

FRAMING NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS WITH ARCHITECTURAL PLANS BEFORE COMMENCING WORK.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ANY ADDITIONAL DIMENSIONS.
3. REFER TO ARCH'L PLANS FOR ROOF OVERHANG DIMENSION.
4. CONTRACTOR TO COORDINATE ALL MECHANICAL, ELECTRICAL AND PLUMBING COMPONENTS SUPPORTED BY THE STRUCTURE WITH THE STRUCTURE MANUFACTURER.
5. REFER TO M.E.P. DRAWINGS FOR ANY HOUSEKEEPING PADS AT MECHANICAL ROOMS.

N
PLAN NORTH

ROOF FRAMING PLAN
SCALE: 1/8"=1'-0"

HIDALGO COUNTY, PCT1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

- TX 78577
TEL: (956) -

DATE: —

DRAWING TITLE:
ROOF FRAMING PLAN

FILE NAME:

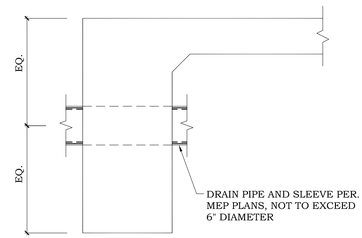
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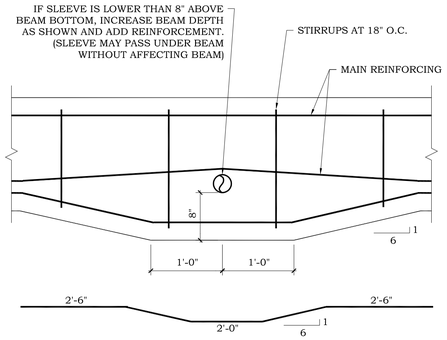
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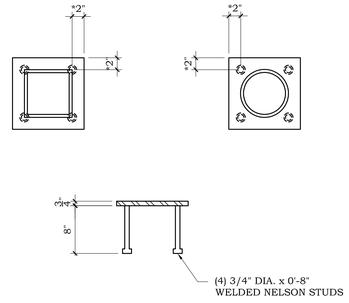
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PIPE EXTERIOR FOOTING | 17

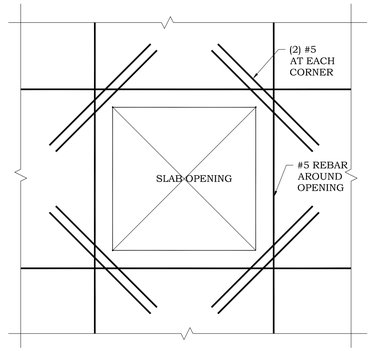


TYPICAL SLEEVE IN GRADE BEAM | 13



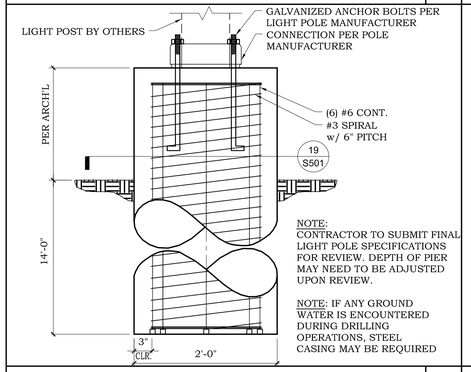
NOTE: * DIMENSION FROM EDGE OF PLATE TO FACE OF COLUMN

BASE PLATE DETAIL | 9



OPENINGS IN SLAB | 5

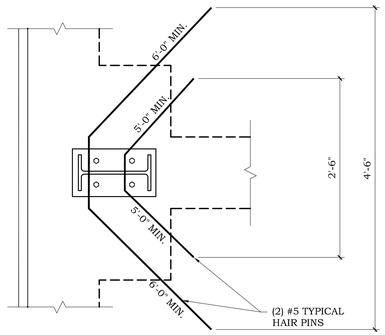
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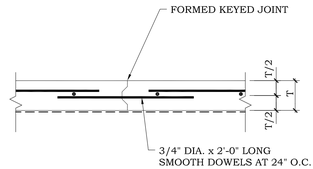
NOTE:
CONTRACTOR TO SUBMIT FINAL LIGHT POLE SPECIFICATIONS FOR REVIEW. DEPTH OF PIER MAY NEED TO BE ADJUSTED UPON REVIEW.

NOTE: IF ANY GROUND WATER IS ENCOUNTERED DURING DRILLING OPERATIONS, STEEL CASING MAY BE REQUIRED

LIGHT POLE DETAIL (TYP) | 18



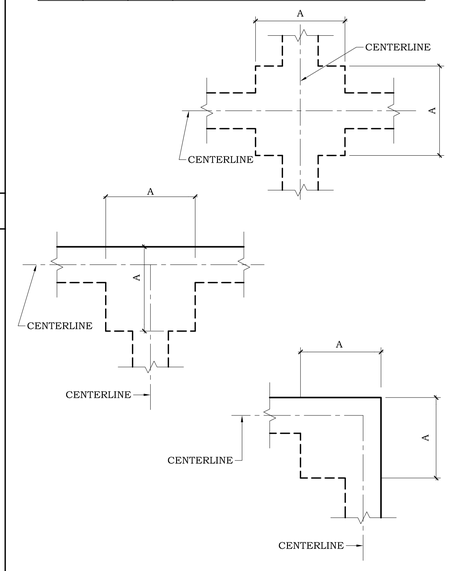
TYPICAL HAIR PINS | 14



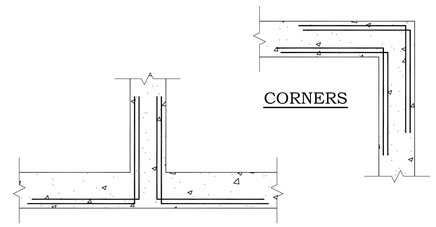
1. CONTRACTOR TO SUBMIT ANY PROPOSED LOCATIONS OF CONSTRUCTION JOINTS TO STRUCTURAL ENGINEER BEFORE COMMENCING WORK.
2. GRADE BEAM REINFORCING SHALL BE CONTINUOUS THRU JOINT

CONSTRUCTION JOINT DETAIL | 10

FOOTING SCHEDULE AT STEEL COLUMNS			
TYPE	A	DEPTH	REBAR REINFORCEMENT
S2	2'-6"	2'-0"	#5'S @ 12" O.C. E.W. TOP & BOTTOM
S3	3'-6"	3'-0"	#5'S @ 12" O.C. E.W. TOP & BOTTOM
S4	4'-6"	3'-0"	#5'S @ 12" O.C. E.W. TOP & BOTTOM
S5	5'-6"	3'-0"	#5'S @ 12" O.C. E.W. TOP & BOTTOM
S6	6'-6"	3'-0"	#5'S @ 12" O.C. E.W. TOP & BOTTOM
S7	7'-6"	3'-0"	#6'S @ 12" O.C. E.W. TOP & BOTTOM

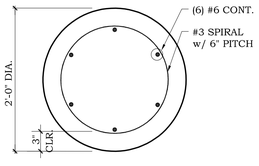


FOOTING SCHEDULE | 7

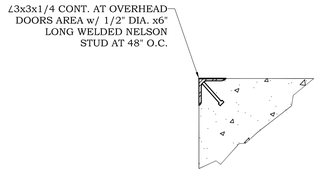


NOTE:
PROVIDE (4) #6 x 6'-0" CORNER BARS
(2-TOP & 2-BOTTOM) AS SHOWN IN DETAILS ABOVE

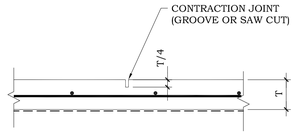
TYPICAL CORNER BARS | 2



PIER DETAIL | 19

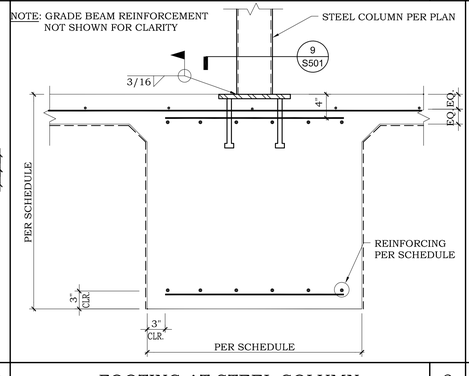


EXTERIOR FOOTING AT OVERHEAD DOOR | 15

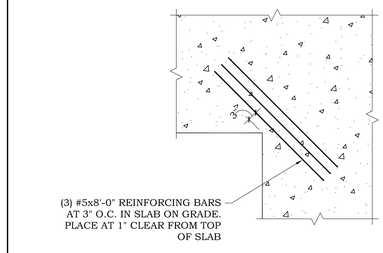


1. JOINT PATTERN SHALL BE NEARLY SQUARE
2. JOINT SPACING SHALL NOT EXCEED 15'-0"

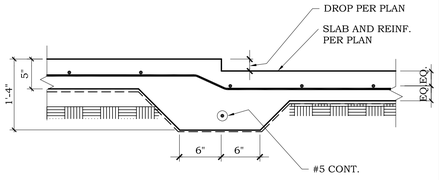
CONTRACTION JOINT DETAIL | 11



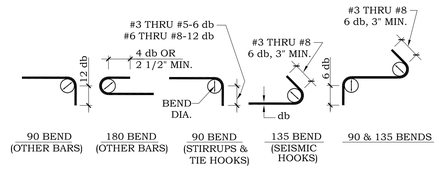
FOOTING AT STEEL COLUMN | 8



TYPICAL SLAB REINFORCING | 3



DROP AT SLAB ON GRADE | 12



DIAMETER OF BENDS	
STIRRUPS AND TIES	4 db FOR #3 THRU #5 BARS
	6 db FOR #6 THRU #8 BARS
ALL OTHERS	6 db FOR #3 THRU #8 BARS
	8 db FOR #9 THRU #11 BARS
	10 db FOR #14 THRU #18 BARS

STANDARD HOOKS | 4

NOT USED | 20

NOT USED | 16

CHANIN ENGINEERING, LLC
TBPE FIRM REG. NUMBER F-9369
PH: (956) 687-9421
FAX: (956) 687-3211
400 Nolana, Suite H2
McAllen, Texas 78504
www.chaninengineering.com
STATE OF TEXAS
MIGUEL CHANIN
93127
LICENSED PROFESSIONAL ENGINEER
11-6-20

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

- TX 78577
TEL: (956) -

DATE: —

DRAWING TITLE:
DETAILS

FILE NAME:

JOB NO.: 18325

DATE: 11/06/2020

DRAWN BY: J.P./L.R./VDV

CHECKED BY: M.C.

SHEET: S501

NOT USED 17

NOT USED 18

NOT USED 19

NOT USED 20

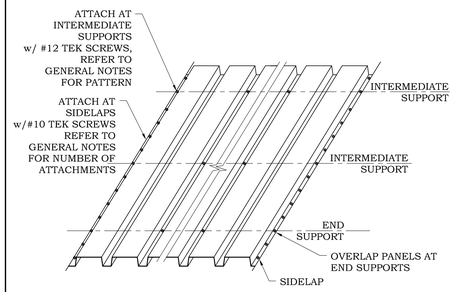
NOT USED 13

NOT USED 14

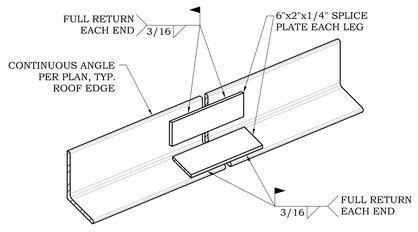
NOT USED 15

NOT USED 16

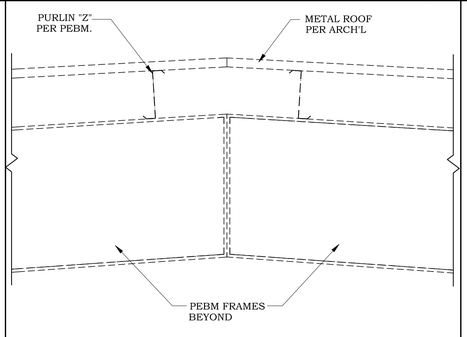
TYPICAL METAL DECK ATTACHMENT 9



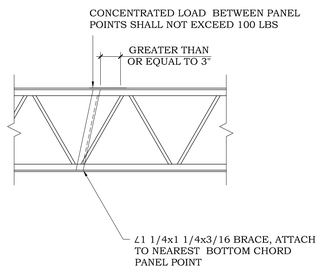
TYPICAL ROOF EDGE ANGLE SPLICE DETAIL 11



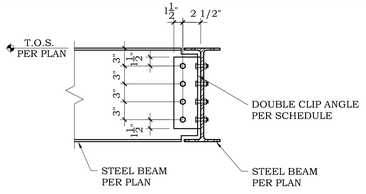
RIGID FRAME DETAIL 12



JOIST BRACING AT CONCENTRATED LOAD 10

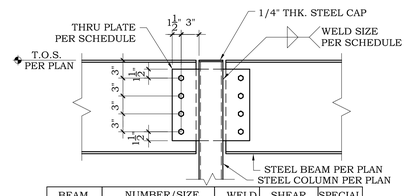


STEEL BEAM TO STEEL BEAM CONNECTION 7



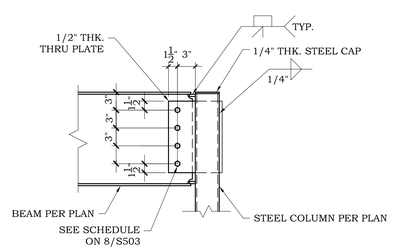
BEAM SIZE	NUMBER OF ROWS/ SIZE OF BOLTS	CLIP ANGLE
W8, W10	(2) 3/4" DIA. A325	∠4x3 1/2 x1/4
W12, W14	(3) 3/4" DIA. A325	∠4x3 1/2 x1/4
W16	(4) 3/4" DIA. A325	∠4x3 1/2 x1/4
W18	(5) 3/4" DIA. A325	∠4x3 1/2 x1/4
W21	(6) 3/4" DIA. A325	∠4x3 1/2 x1/4
W24	(7) 3/4" DIA. A325	∠4x3 1/2 x1/4
W27	(8) 3/4" DIA. A325	∠4x3 1/2 x1/4
W30	(9) 3/4" DIA. A325	∠4x3 1/2 x1/4

STEEL COLUMN TO STEEL BEAM CONNECTION 8

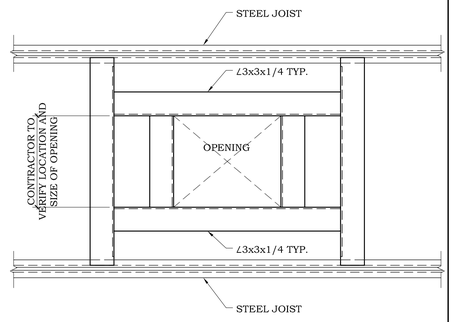


BEAM SIZE	NUMBER/SIZE OF BOLTS	WELD SIZE	SHEAR PLATE	SPECIAL NOTES
W8, W10	(2) 3/4" DIA. A325	3/16"	1/2" THK.	-
W12, W14	(3) 3/4" DIA. A325	3/16"	1/2" THK.	-
W16	(4) 3/4" DIA. A325	1/4"	1/2" THK.	-
W18	(5) 3/4" DIA. A325	1/4"	1/2" THK.	-
W21	(6) 3/4" DIA. A325	1/4"	1/2" THK.	-
W24	(7) 3/4" DIA. A325	1/4"	1/2" THK.	-
W27	(8) 3/4" DIA. A325	1/4"	1/2" THK.	-
W30	(9) 3/4" DIA. A325	1/4"	1/2" THK.	-

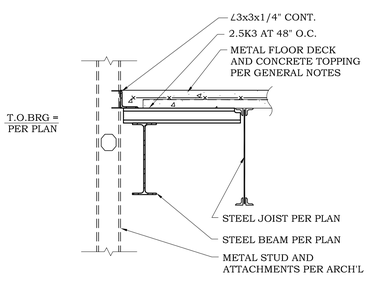
MOMENT CONNECTION 5



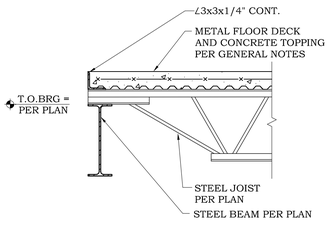
SUPPORT FOR METAL DECK OPENING 6



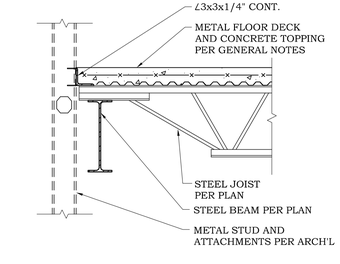
STEEL JOIST TO STEEL BEAM 1



STEEL JOIST TO STEEL BEAM 2



STEEL JOIST TO STEEL BEAM 3



STEEL JOIST TO STEEL BEAM 4

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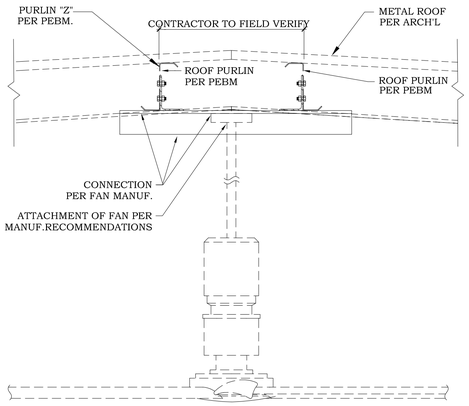
JOB NO.: 18325

DATE: 11/06/2020

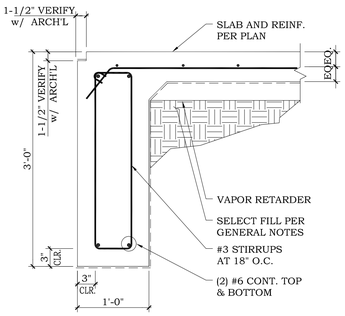
DRAWN BY: J.P./L.R./VDV

CHECKED BY: M.C.

SHEET:
S502

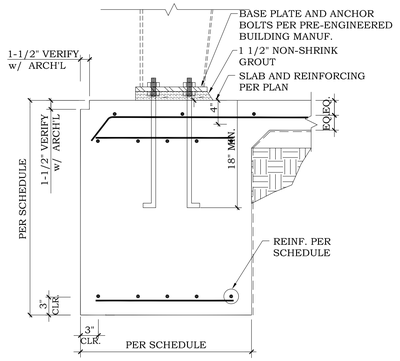


FAN TO RIGID FRAME | 13



EXTERIOR GRADE BEAM | 9

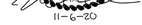
NOTE: GRADE BEAM REINFORCEMENT
NOT SHOWN FOR CLARITY



FOOTING AT STEEL COLUMN | 5

NOT USED | 1

CHANIN
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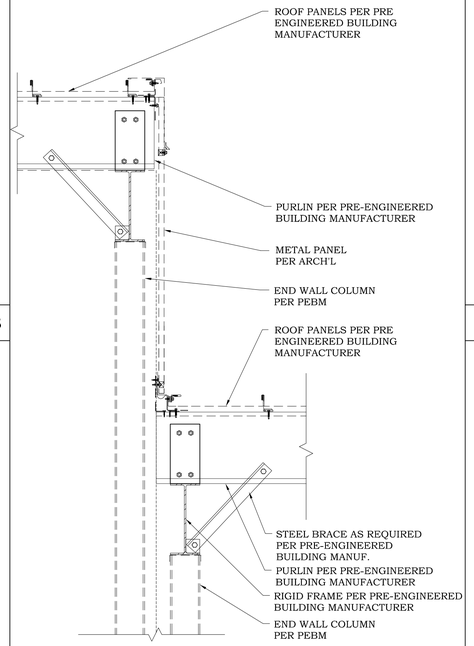


11-6-20

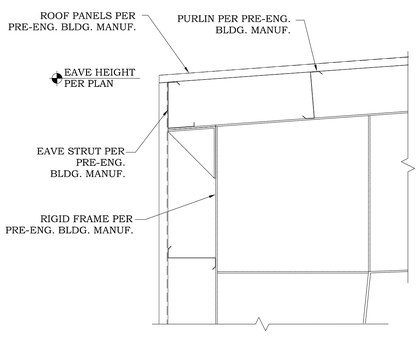
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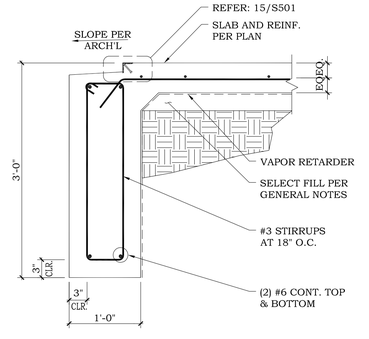
NOT USED | 18



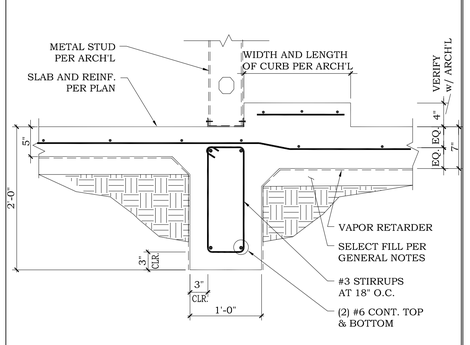
RIGID FRAME DETAIL | 15



RIGID FRAME DETAIL | 10



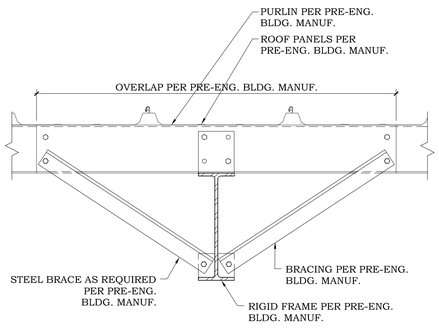
EXTERIOR GRADE BEAM | 6



INTERIOR GRADE BEAM | 2

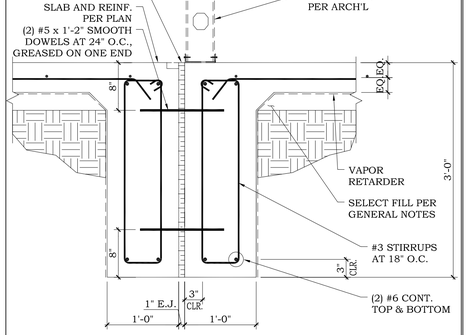
NOT USED | 19

NOT USED | 16



RIGID FRAME DETAIL | 12

INTERIOR GRADE BEAM | 7



INTERIOR GRADE BEAM | 3

NOT USED | 20

NOT USED | 16

NOT USED | 8

EXPANSION JOINT | 4

- TX 78577
TEL: (956) -

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
.
MERCEDES, TEXAS

DETAILS

DATE: —

DRAWING TITLE:

FILE NAME:

JOB NO.: 18325

DATE: 11/06/2020

DRAWN BY: JP./LR./VDV

CHECKED BY: M.C.

SHEET: S601

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL. (956) 968-8733
FAX. (956) 969-1017

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SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/20

DRAWING TITLE:
DOOR/WINDOW SCHEDULES

FILE NAME:

JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

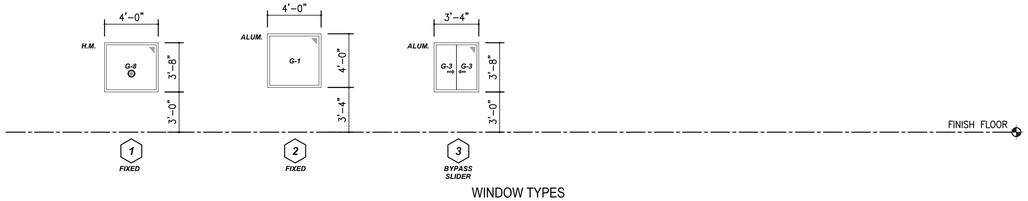
SHEET: A2.00

WINDOW SCHEDULE

MARK	FRAME SIZE W x H	WINDOW ELEV	FR MAT'L	DETAILS SILL	DETAILS JAMB	DETAILS HEAD	H.W.	REMARKS
1	4'-0" x 3'-8"	A	H.M.	2/A9.00	7/A9.00	7/A9.00	-	REF: SPECS., INSTALL CLR 834 SERIES NO DRAFT SPEAK THRU
2	4'-0" x 4'-0"	B	ALUM	3/A9.00	6&7/A9.00	12/A9.00	-	ADD BLINDS, REF: SPECS.
3	3'-4" x 3'-8"	C	ALUM	17/A9.01	17/A9.01	17/A9.01	-	ADD LOCKS, REF: SPECS.

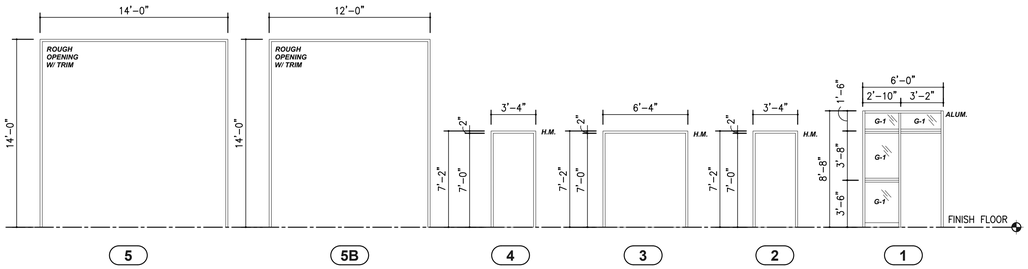
GLASS TYPES

G-1 TINTED TEMPERED GLASS, REF: SPECS.
G-3 CLEAR TEMPERED GLASS, REF: SPECS.
G-8 BULLET RESISTANT GLASS, REF: SPECS.



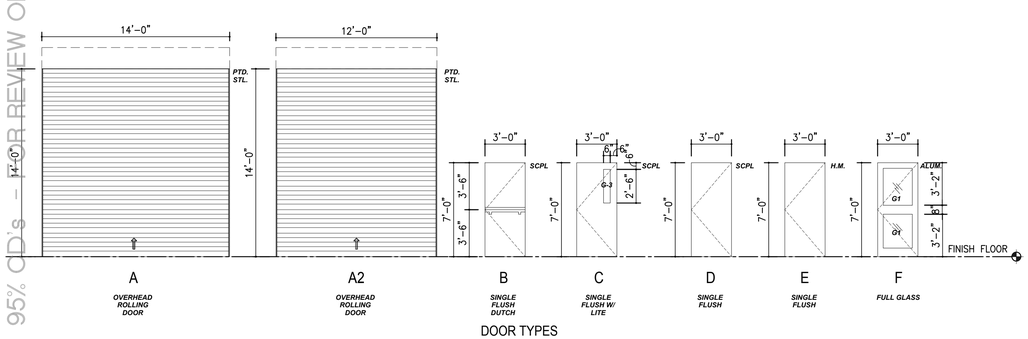
WINDOW TYPES

15 WINDOW ELEVATIONS
SCALE: N.T.S.



FRAME TYPES

10 FRAME ELEVATIONS
SCALE: N.T.S.



DOOR TYPES

95% CD's - FOR REVIEW ONLY

5 DOOR ELEVATIONS
SCALE: N.T.S.

FINISH SCHEDULE

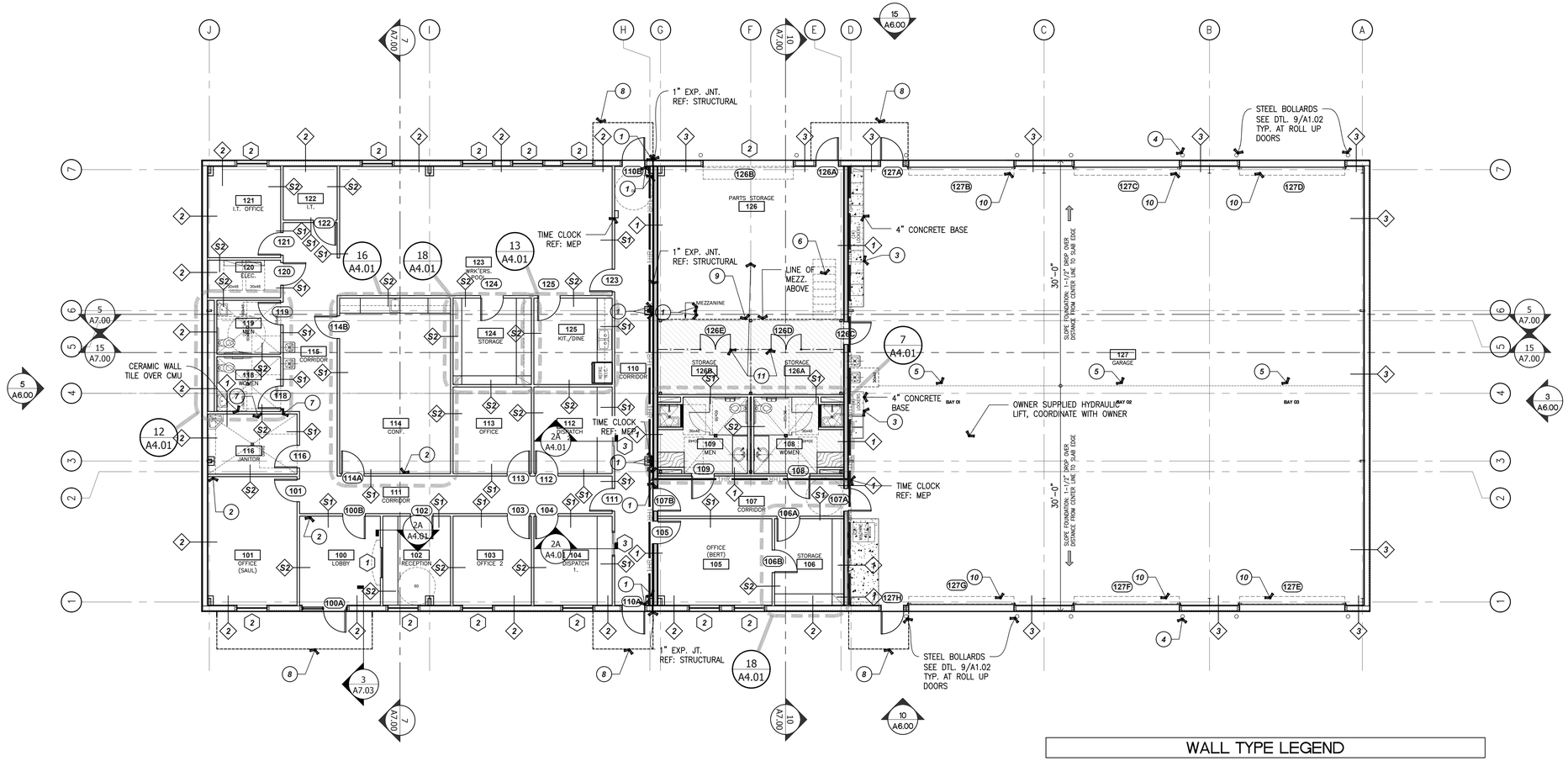
RM. NO.	RM. NAME	FLOOR: CARPET	FLOOR: VCT	FLOOR: CERAMIC TILE	FLOOR: QUARRY TILE	FLOOR: SEALED CONCRETE	FLOOR: TERRAZO	BASE: RESILIENT BASE	BASE: CERAMIC TILE COVE	BASE: QUARRY TILE	BASE: NONE	WALL: V.W.C.	WALL: GYP. BD. - PAINT	WALL: F.R.P. PANEL OVER M.R. GYP. BD.	WALL: CMU EPOXY FINISH	WALL: CERAMIC TILE	WALL: FACE BRICK	WALL: VINYL WALL COVERING	WALL: 8" MTL. LINER PANEL WAINSCOT	CEILING: 2'x2' LAY-IN TYPE 'A'	CEILING: GYPSUM BD. - PTD.	CEILING: EXPOSED STRUCTURE	CEILING: EXPOSED STRUCTURE, PTD.	CEILING: M.R. GYP. BD., PTD.	CEILING HEIGHT	REMARKS
																										● MATERIAL AND FINISH APPLY TO ALL SURFACES ⊗ MATERIAL FINISH APPLY ON SURACE BY QUADRANT ORIENTATION SAME AS FLOOR PLAN
100	LOBBY	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
101	OFFICE	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
102	RECEPTION	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
103	OFFICE	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
104	DISPATCH 1	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
105	OFFICE	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
106	STORAGE	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
107	CORRIDOR	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
108	WOMEN'S RESTROOM				●						●			●		●								●	9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
109	MEN'S RESTROOM				●						●			●		●								●	9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
110	CORRIDOR	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
111	CORRIDOR	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
112	DISPATCH 2	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
113	OFFICE	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
114	CONFERENCE ROOM	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
115	CORRIDOR	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
116	JANITOR	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
117	NOT USED																								-	-
118	WOMEN'S RESTROOM				●						●			●		●								●	9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
119	MEN'S RESTROOM				●						●			●		●								●	9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
120	ELECTRICAL CLOSET	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
121	I.T. OFFICE	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
122	I.T. CLOSET	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
123	WORKERS POOL	●						●					●						●	●					10' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
124	STORAGE	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
125	KITCHEN/DINING	●						●					●						●	●					9' - 0" A.F.F.	PROVIDE SOUND BATT INSUL. OVER CEILING
126	PARTS STORAGE				●						●		⊗	●				⊗				●			17' - 0" - 21' - 0" A.F.F.	
126A	STORAGE CAGE				●						●		⊗									●			17' - 0" - 21' - 0" A.F.F.	
126B	STORAGE CAGE				●						●		⊗									●			17' - 0" - 21' - 0" A.F.F.	
127	GARAGE				●						●								●						17' - 0" - 21' - 0" A.F.F.	

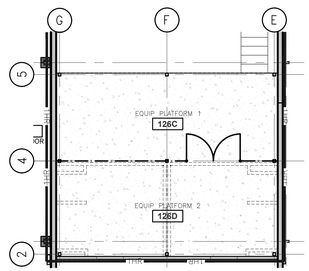
***NOTE: MATERIAL COLORS TO BE DETERMINED DURING CONSTRUCTION. REFERENCE SPECIFICATIONS FOR MATERIAL GRADE/COLOR PERCENTAGES.

DOOR SCHEDULE

MARK	DOOR SIZE W x H	DR ELEV	DR MAT'L	FRAME SIZE	FR ELEV	FR MAT'L	DETAILS SILL	DETAILS JAMB	DETAILS HEAD	H.W.	FIRE RATING LABEL	REMARKS
100A	3' - 0" x 7' - 0"	F	ALUM	6' - 0" x 7' - 2"	1	ALUM	-	-	-	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
100B	3' - 0" x 7' - 0"	C	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
101	3' - 0" x 7' - 0"	C	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
102	3' - 0" x 7' - 0"	C	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
103	3' - 0" x 7' - 0"	C	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
104	3' - 0" x 7' - 0"	C	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
105	3' - 0" x 7' - 0"	D	H.M.	3' - 4" x 7' - 2"	2	H.M.	A9.01	3/A9.00	8/A9.00	-	1 HR.	REF: SPECS. FOR HARDWARE SCHEDULE
106A	3' - 0" x 7' - 0"	B	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
106B	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
107A	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	A9.01	3/A9.00	8/A9.00	-	45 MIN.	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
107B	3' - 0" x 7' - 0"	D	H.M.	3' - 4" x 7' - 2"	4	H.M.	A9.01	3/A9.00	8/A9.00	-	1 HR.	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
108	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
109	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
110A	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	-	-	-	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
110B	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	-	-	-	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
111	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
112	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
113	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
114A	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
114B	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	-
115	-	-	-	-	-	-	-	-	-	-	-	NO DOORS
116	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	A9.01	1/A9.00	6/A9.00	-	-	SEE ADDITIONAL DTLS. SH. A9.01
117	NOT USED	-	-	-	-	-	-	-	-	-	-	-
118	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	SEE ADDITIONAL DTLS. SH. A9.01
119	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	SEE ADDITIONAL DTLS. SH. A9.01
120	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	SEE ADDITIONAL DTLS. SH. A9.01
121	3' - 0" x 7' - 0"	C	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	SEE ADDITIONAL DTLS. SH. A9.01
122	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
123	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
124	3' - 0" x 7' - 0"	D	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
125	3' - 0" x 7' - 0"	C	SCWD	3' - 4" x 7' - 2"	2	H.M.	A9.01	1/A9.00	6/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE
126A	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	-	-	-	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
126B	12' - 0" x 14' - 0"	A2	STL.	12' - 0" x 14' - 0"	5B	H.M.	15/A9.01	14/A9.01	13/A9.01	-	-	REF: SPECS. FOR MANUFACTURER REQ' - POWERED OPENER
126C	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	A9.01	3/A9.00	8/A9.00	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
126D	PR. 2' - 0" x 6' - 0"	-	-	-	-	-	-	-	-	-	-	MESH PANEL ENCLOSURE, REF: SPECS.
126E	PR. 2' - 0" x 6' - 0"	-	-	-	-	-	-	-	-	-	-	MESH PANEL ENCLOSURE, REF: SPECS.
127A	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	-	-	-	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS
127B	14' - 0" x 14' - 0"	A	STL.	14' - 0" x 14' - 0"	5	H.M.	15/A9.01	14/A9.01	13/A9.01	-	-	REF: SPECS. FOR MANUFACTURER REQ' - POWERED OPENER
127C	14' - 0" x 14' - 0"	A	STL.	14' - 0" x 14' - 0"	5	H.M.	15/A9.01	14/A9.01	13/A9.01	-	-	REF: SPECS. FOR MANUFACTURER REQ' - POWERED OPENER
127D	14' - 0" x 14' - 0"	A	STL.	14' - 0" x 14' - 0"	5	H.M.	15/A9.01	14/A9.01	13/A9.01	-	-	REF: SPECS. FOR MANUFACTURER REQ' - POWERED OPENER
127E	14' - 0" x 14' - 0"	A	STL.	14' - 0" x 14' - 0"	5	H.M.	15/A9.01	14/A9.01	13/A9.01	-	-	REF: SPECS. FOR MANUFACTURER REQ' - POWERED OPENER
127F	14' - 0" x 14' - 0"	A	STL.	14' - 0" x 14' - 0"	5	H.M.	15/A9.01	14/A9.01	13/A9.01	-	-	REF: SPECS. FOR MANUFACTURER REQ' - POWERED OPENER
127G	14' - 0" x 14' - 0"	A	STL.	14' - 0" x 14' - 0"	5	H.M.	15/A9.01	14/A9.01	13/A9.01	-	-	REF: SPECS. FOR MANUFACTURER REQ' - POWERED OPENER
127H	3' - 0" x 7' - 0"	E	H.M.	3' - 4" x 7' - 2"	4	H.M.	-	-	-	-	-	REF: SPECS. FOR HARDWARE SCHEDULE, SECURED ACCESS

3 SCHEDULES
SCALE: N.T.S.





GENERAL ARCHITECTURAL DRAWING NOTES

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2. BUILDING FLOOR PLAN DIMENSIONS ARE REFERENCED FROM STRUCTURAL GRID, FACE OF CONCRETE, FACE OF MASONRY, OR FACE OF FINISHED SURFACE, UNLESS NOTED OTHERWISE.
3. REFLECTED CEILING PLAN DIMENSIONS ARE REFERENCED FROM FINISHED SURFACES UNLESS NOTED OTHERWISE. CEILING HEIGHTS ARE DIMENSIONED FROM FLOOR TO FINISHED CEILING HEIGHT.
4. CASEWORK, PLUMBING FIXTURES, TOILET PARTITIONS, AND OTHER FIXTURES AND EQUIPMENT ARE DIMENSIONED FROM FINISHED SURFACES UNLESS NOTED OTHERWISE.
5. DIMENSIONS NOTED AS "FIELD VERIFY" SHALL BE CHECKED AT THE SITE BY THE CONTRACTOR AND REVIEWED WITH THE ARCHITECT BEFORE INCORPORATING INTO THE WORK.
6. DIMENSIONS NOTED AS "CLEAR" REQUIRE SPECIFIC COORDINATION BETWEEN DISCIPLINES AND/OR MANUFACTURERS.
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8. DO NOT SCALE DRAWING. WRITTEN DIMENSIONS TAKE PRECEDENCE. IF CLARIFICATION IS REQUIRED IN ORDER TO DETERMINE THE INTENT OF THE CONTRACT DOCUMENTS, CONTACT THE ARCHITECT.
9. NOTES OR DIMENSIONS LABELED "TYPICAL" SHALL APPLY TO SITUATIONS THAT ARE THE SAME OR SIMILAR.

KEYED NOTES

1. EXPANSION JOINT COVERS. REF: SPECS. WALL TO FLOOR, WALL TO CEILING, WALL TO WALL.
2. T.V. MOUNTS, REF: SPECS. COORDINATE LOCATION WITH ARCHITECT.
3. TWO (2) LEVELS 15"x15"x36" METAL LOCKERS, STACKED, REF: SPECS.
4. CONCRETE FILLED STEEL BOLLARDS, PTD. (TYP.), SEE DTL. 9/A1.02. REF: SPECS.
5. FANS. SEE MEP, REF: SPECS.
6. SHIP LADDER. REF: SPECS.
7. ROOF HATCH AND WALL MOUNTED LADDER. SEE DTL.1/A3.02, REF: SPECS.
8. ALUM. MTL. AWNING. REF: SPECS.
9. PTD. STEEL GUARD RAILS, RAILING AND ACCESS GATE. REF: SPECS.
10. TRENCH DRAIN. COORDINATE WITH MEP, REF: SPECS.
11. WIRE MESH PARTITIONS WITH GATES, HEIGHT 9'–0" ± 6" TO UNDERSIDE OF MEZZANINE. COORDINATE WITH MEZZANINE INSTALLATION. REF: SPECS.
12. MOP SINK DETAIL, SEE DTL. 20/A4.01. REF: SPECS.

WALL TYPE LEGEND

1. 1 HOUR FIRE WALL – UL U425: (2) LAYERS 5/8" TYPE X GYP. BD. OVER 8" METAL STUDS @ 16" O.C
2. METAL PANEL OVER 8" Z–GIRTS OVER RIGID FRAME OVER FILLED CAVITY DOUBLE LAYER FACED METAL BUILDING INSULATION OVER LINER SYSTEM W/ 2 1/2" MTL. STUDS @ 16 O.C. AND 2" RIGID INSULATION AND 5/8" TYPE 'X' GYP. WALL BOARD, PTD.
3. METAL PANEL OVER 8" Z–GIRTS OVER RIGID FRAME OVER FACED METAL BUILDING INSULATION

NOTE: SEE WALL SECTIONS FOR EXTERIOR WALL DETAILS AND SH. A7.04, A7.05, A7.06, A7.07, A7.08 FOR INTERIOR PARTITION DETAILS.

NOTE: SEE SH. A5.00, A5.01, A8.00 FOR WALL FINISH/ENVELOPE DETAILS.

NOTE: ALL INTERIOR WALLS WITH OUTSIDE CORNERS TO RECEIVE CORNER GUARDS. REF: SPECS.

LEGEND OF SYMBOLS

ONE HOUR RATED FIRE BARRIER — UL – U425

NOTES – REFER TO SPECIFICATIONS FOR MORE INFORMATION.

1. REFER TO WALL PARTITION TYPES ON SHEETS A7.04, A7.05, A7.06, A7.07 AND A7.08.
2. PROTECT ALL CONDUIT, PIPES, DUCTS, AND MISC PENETRATIONS THROUGH RATED WALLS, FLOOR OR ROOF WITH FIRE SAFING INSULATION AND FIRE STOP SEALANT. REFER TO UL GUIDELINES FOR APPROPRIATE ASSEMBLIES.
3. UL ASSEMBLIES INDICATED ESTABLISH A BASIS PERFORMANCE. OTHER ASSEMBLIES MAY BE CONSIDERED AT THE DISCRETION OF THE ARCHITECT IF EQUIVALENT PERFORMANCE IS PROVIDED. SUBSTITUTION PROPOSALS SHALL INCLUDE CHANGES REQUIRED TO ALL COMPONENTS OF THE ASSEMBLY.
4. BUILDING TO BE EQUIPPED WITH MANUAL FIRE ALARM SYSTEM + OCCUPANT NOTIFICATION PER NFPA 72.
5. REFER TO SHEET FA201 FOR FIRE ALARM PLAN.

0 4' 8' 16' 24'
SCALE: 1/8" = 1'-0"

N — PLAN NORTH — TRUE NORTH

5 FLOOR PLAN
Scale: 1/8" = 1'-0"

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464–8258 FAX: (956) 464–8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/20

100% CD's – FOR CONSTRUCTION

DRAWING TITLE: FLOOR PLAN

FILE NAME:

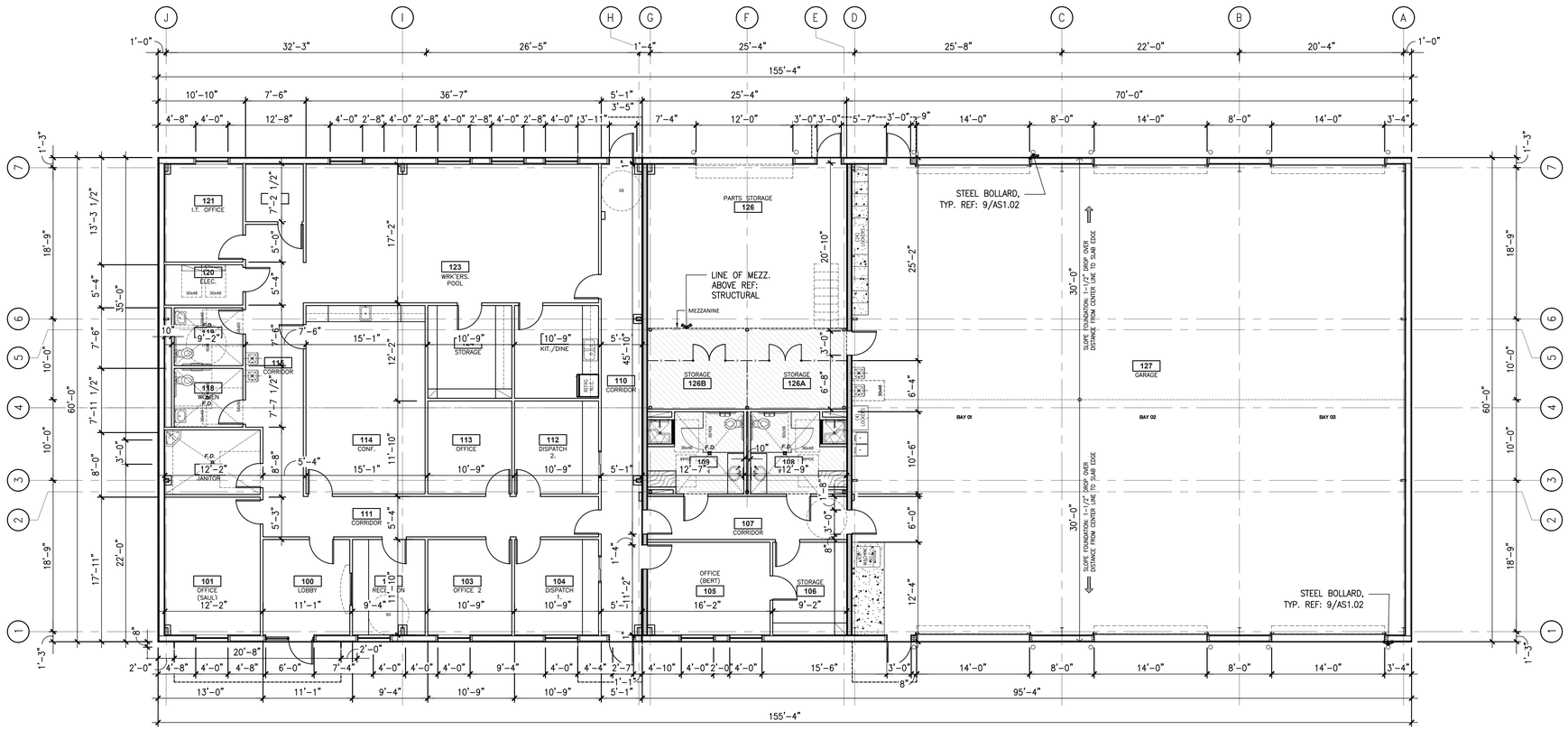
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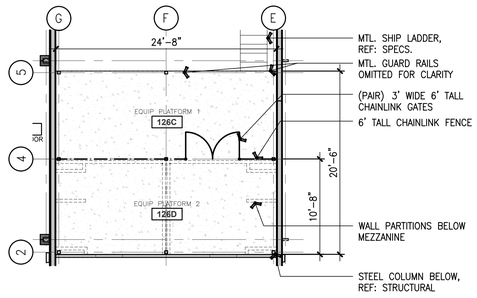
DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: A2.01





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LEGEND

F.D. – FLOOR DRAIN

0 4' 8' 16' 24'

SCALE: ⅛" = 1'-0"

PLAN NORTH TRUE NORTH

100% CD's - FOR CONSTRUCTION

5 DIMENSIONAL FLOOR PLAN
Scale: 1/8" = 1'-0"

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307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

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TEL: (956) 968-8733
FAX: (956) 969-4417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT CHRISTOPHER ALVARADO 23453 STATE OF TEXAS

DATE: 11/06/20

DRAWING TITLE:
DIMENSIONAL FLOOR PLAN

FILE NAME:

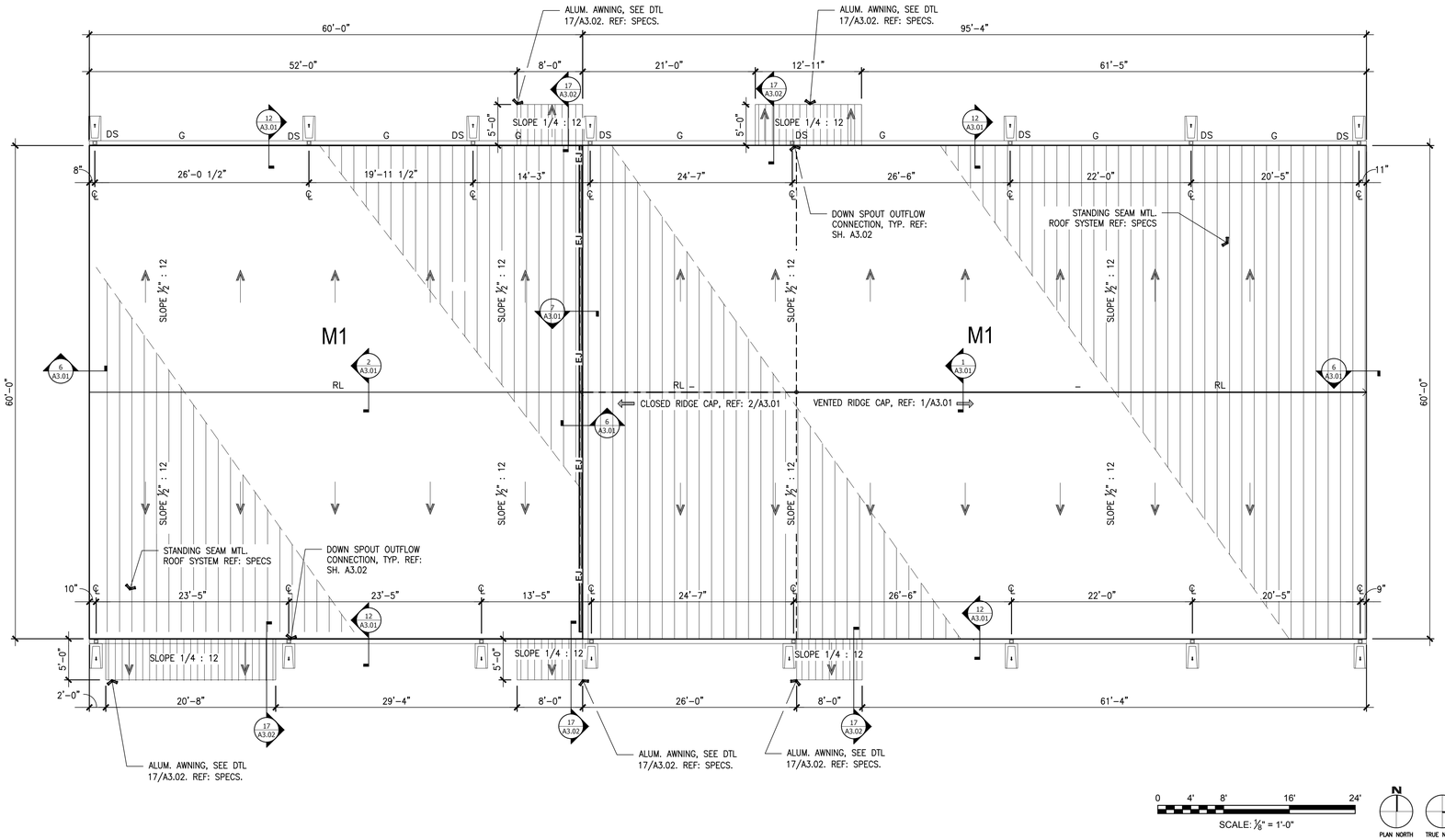
JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: A2.02



10 ROOF PLAN
Scale: 1/8" = 1'-0"

LEGEND

* NOTE: REFERENCE SPECIFICATIONS FOR ROOF EQUIPMENT AND ACCESSORIES.

- PLUMBING VENT
- FLANGE VENT
- PITCH PAN
- NEW ROOF DRAIN
- EXIST. ROOF DRAIN
- OF — OVERFLOW DRAINS
- WALL DRAIN
- CURB MOUNTED VENT
- CURB MOUNTED INTAKE
- ABANDONED CURB TO BE REMOVED/PATCHED
- GUY WIRE
- POWER VENT
- HEATER VENT
- BOILER VENT
- TURBINE VENT
- A — ABANDON EQUIP.
- GOOSE NECK VENT
- AC — CURB MOUNTED AC
- SPLASH BLOCK
- SPLASH PAN
- A/C ON POSTS
- ROOF HATCH
- SL — SKYLIGHTS
- ANTENNA
- SATELLITE DISH
- S — SCUPPER
- G — GUTTER
- DS — DOWNSPOUT
- WALL LADDER
- SWING LADDER
- —G— GAS LINE
- — E — ELEC. LINE
- PB — PIPE BOX
- EXHAUST AND SUPPLY FAN ON SINGLE CURB
- RL — RIDGE LINE
- EXISTING AREA TO REMAIN - N.I.C.
- NEW TAPERED INSULATION/CRICKET
- A1 — ROOF AREA DESIGNATION
- TAPERED LIGHT WEIGHT CONCRETE
- DESIGNATES EXTENTS OF WORK PER KEYED NOTES
- —AD— AREA DIVIDER
- —EJ— EXPANSION JOINT
- —C— CONDINSATE LINE
- —W— WATER LINE

NOTE: CONTRACTOR TO VERIFY MEP DRAWINGS FOR LOCATION, SIZE AND NOTES FOR ALL NEW MEP ROOFTOP EQUIPMENT, PIPELINES AND DUCTWORK.

NOTE: ALL ROOFING WORK SHALL OCCUR IN SUCH A MANNER AS NOT TO VOID ANY EXISTING ROOF WARRANTIES. CONTRACTOR TO CONTACT ROOFING MANUFACTURER PRIOR TO COMMENCING THE WORK. NO EXCEPTIONS.

NOTE: ROOFING DETAILS MAY NOT BE REFERENCED, CONTRACTOR TO COORDINATE.

NOTE: SEE SH. A3.01 FOR MFR. TYPICAL ROOFING DETAILS.

ROOFING NOTES

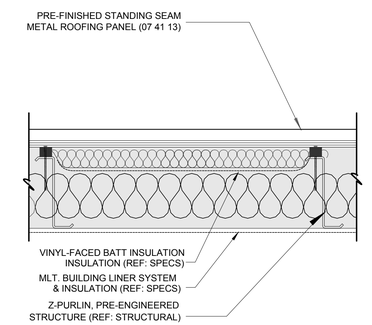
1. CONTRACTOR SHALL REVIEW AND COORDINATE WITH ARCHITECTURAL, MEP, AND STRUCTURAL DOCUMENTS TO ASCERTAIN EXACT CONDITIONS AND COMPONENTS RELATED TO THE WORK DESCRIBED BY THESE DOCUMENTS. ALL WORK SHALL BE IN ACCORDANCE WITH ACCEPTED MANUFACTURER'S PRINTED INSTRUCTIONS AND NRCA STANDARDS.
2. DIMENSIONS, DETAILS, EQUIPMENT SIZE AND LOCATION SHOWN IN THESE CONSTRUCTION DOCUMENTS ARE FOR CONVEYANCE OF DESIGN INTENT ONLY. EXACT SIZE, LOCATION, TYPE OF MATERIAL AND TYPE OF CONSTRUCTION OF EXISTING CONDITIONS ARE THE RESPONSIBILITY OF THE CONTRACTOR TO ASCERTAIN AND CONFIRM.
3. REFER TO NOMENCLATURE FOR TYPE OF ROOF SYSTEM. AREAS ARE MARKED WITH DESIGNATED LETTER, SEE ROOF PLAN AND NOMENCLATURE.
4. NOTE THAT THE DETAILS DRAWN ARE GENERIC IN NATURE AND ARE NOT NECESSARILY LOCATED AND KEYED TO THE ROOF PLANS.
5. ALL NEW CRICKETS AND TAPERED INSULATION SHALL BE INSTALLED WITH A FINISHED 1/4" PER FOOT MIN. SLOPE.
6. CRICKET THE UP SLOPE SIDE OF ALL SQUARE CURBS AND PROJECTIONS OVER 20" IN WIDTH.
7. ALL CURB MOUNTED HVAC UNITS, EQUIPMENT, ETC. SHALL HAVE A MINIMUM 10" CURB HEIGHT.
8. WORK TO ANY UTILITY CONDUIT OR PIPE SHALL BE PERFORMED BY SPECIFIC LICENSED SUBCONTRACTORS SPECIALIZING IN HVAC, PLUMBING AND ELECTRICAL WORK. PERMITS AND INSPECTIONS ARE REQUIRED.
9. UNLESS INDICATED OTHERWISE ON THE CONSTRUCTION DOCUMENTS, ALL EXISTING JOINTS / AREA DIVIDERS / CURB MOUNTED EQUIPMENT / SKYLIGHTS SHALL BE MIN. 10" ABOVE ROOF DECK.
10. ALL SOIL STACK FLASHING SHALL BE A MIN. 10" ABOVE FINISHED ROOF SURFACE. COUPLE PVC PIPE ABOVE DECK AND COUPLE CAST IRON PIPE BELOW DECK. PROPERLY SUPPORT PIPE BELOW ROOF DECK FROM LATERAL MOVEMENT.
11. ALL PIPING/ CONDUITS/ ETC. SHALL BE A MIN. 10" ABOVE ROOF SURFACE. PROVIDE PORTABLE PIPE HANGERS WITH PROTECTION PADS AS SPECIFIED (RE:07 72 00). MEP CONTRACTORS SHALL PROVIDE SUPPORTS FOR UTILITY LINES.
12. PROVIDE 22 ga. STAINLESS STEEL, 2D FINISH, TREATED WOOD CURB AND BOX HOOD AT ALL GAS LINE AND WATER LINE ROOF PENETRATIONS (RE: GENERAL DETAILS).
13. PROVIDE SHEET METAL HOODED (WITH METAL FACE CLOSURE) CAPS, WOOD CURB, BOX COVER AT ALL GAS AND WATER PIPE ROOF PENETRATIONS AS DETAILED AND SPECIFIED. PROVIDE POSITIVE SLOPE AWAY FROM FACE COVER.
14. PROVIDE WALKWAY PROTECTION PADS AS SPECIFIED AROUND ALL ROOF HATCHES, HVAC ROOFTOP UNITS, DOORS THAT OPEN ONTO ROOF AND AT TOP AND BOTTOM OF ALL ROOF TOP ACCESS LOCATIONS.
15. ISOLATE ALL HEAT PIPES / FLUES AS DETAILED AND RECOMMENDED AND OUTLINED IN THE NRCA MANUAL FOR HOT STACK FLASHING. (REF: GENERAL DETAILS)
16. ALL OUTSIDE AIR INTAKES SHALL BE COVERED TO ELIMINATE ODORS AND FUMES FROM ENTERING INTO THE BUILDING DURING CONSTRUCTION WORK.
17. AFTER SUBSTANTIAL COMPLETION, THE GENERAL CONTRACTOR SHALL EXAMINE AND CLEAN NEW DRAIN LINES AND NEW AND EXISTING (AS APPLICABLE) GUTTERS OF DEBRIS AND BLOCKAGE, FLUSH WITH WATER TO ENSURE THAT DRAINS AND GUTTERS FLOW FREELY.
18. PRIOR TO COMMENCEMENT OF WORK, COORDINATE WALK OF ENTIRE ROOF WITH ROOFING MANUFACTURER'S TECHNICAL REPRESENTATIVE TO IDENTIFY AND LOCATE ALL AREAS OF HIGH SLOPE OR OTHER CONDITIONS WHICH MIGHT REQUIRE SPECIAL PROCEDURES FOR SYSTEM ATTACHMENT.
19. REFER TO MEP DRAWINGS FOR SIZE AND LOCATION OF NEW ROOF DECK PENETRATIONS AND ROOF TOP EQUIPMENT.
20. REFER TO GENERAL DETAILS FOR TYPICAL SPLASH PAN, ROOF DRAIN AND OVERFLOW DRAIN DETAILS.
21. GENERAL CONTRACTOR TO ENSURE ALL ROOFTOP PENETRATIONS (SOIL STACKS, VENTS, ETC.) ARE INSTALLED MIN. 4'-0" FROM OTHER DECK PENETRATIONS, RISE WALLS, AND ROOF EDGE. MECHANICAL EQUIPMENT TO BE LOCATED MIN. 10'-0" FROM PERIMETER EDGE AND NO CLOSER THAN 4'-0" FROM RISE WALLS, OR ANY OTHER ROOF PENETRATION.
22. LOCATE PERIMETER DRAINS MAX. 6'-0" FROM EDGE TYPICAL UNLESS SHOWN OTHERWISE. (GENERAL CONTRACTOR TO COORDINATE WITH ROOFING AND PLUMBING CONTRACTOR.)
23. THROUGH WALL BASE FLASHING MIN. HEIGHT 10" AND MAX. HEIGHT 20" FROM FINISH WORK. DO NOT STEP THROUGH WALL FLASHING CLOSER THAN 5'-0" FROM CORNERS.
24. GENERAL CONTRACTOR SHALL COORDINATE LOCATION AND ORIENTATION OF ROOF HATCH AND ACCESS LADDER.
25. GENERAL CONTRACTOR SHALL COORDINATE ALL TOP OF STEEL TO TOP OF BLOCKING AND SUBSTRATE BOARD DIMENSIONS IN FIELD PRIOR TO ORDERING MATERIALS. NO ADDITIONAL COMPENSATION WILL BE GRANTED FOR FAILURE TO COORDINATE THESE DIMENSIONS.
26. GENERAL CONTRACTOR SHALL VERIFY ROOF SLOPES WILL PROPERLY DRAIN AS WORK. TAPERED INSULATION HATCHING SHOWN IS NOT INTENDED TO ILLUSTRATE THE ENTIRE LIMITS OF TAPERED INSULATION. ROOF AREAS NOT SLOPED BY STRUCTURE SHALL BE SLOPED WITH TAPERED INSULATION TO ACHIEVE PROPER DRAINAGE.

7 NOTES AND LEGEND
Scale: N.T.S.

5 NOT USED
Scale: N.T.S.

4 NOT USED
Scale: N.T.S.

3 NOT USED
Scale: N.T.S.



M1

2 ROOFING (METAL) - NOMENCLATURE
Scale: N.T.S.

100% CD's - FOR CONSTRUCTION

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE. STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-4477

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ... STATE OF TEXAS ... DATE: 11/06/20

DRAWING TITLE: ROOF PLAN

FILE NAME:

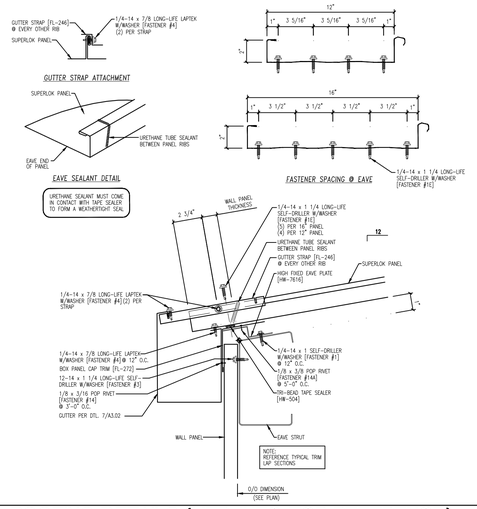
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DATE: 11/06/2020

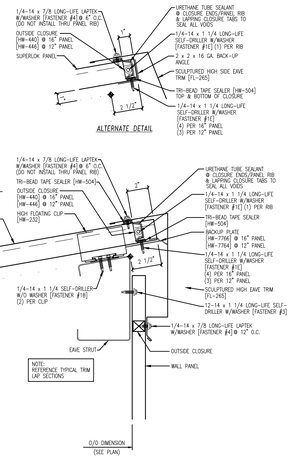
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CHECKED BY: E.A. II/ E.A. III

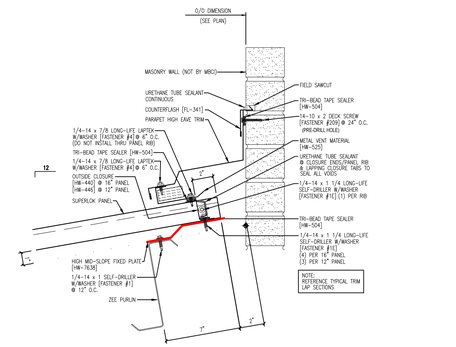
SHEET: A3.00



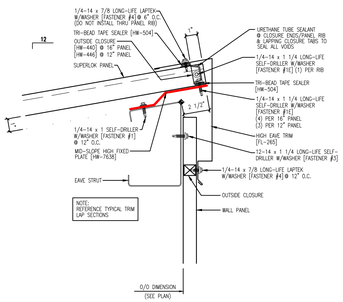
12 ROOFING DETAILS (MFR. INFO FOR REFERENCE)
Scale: N.T.S.



11 ROOFING DETAILS (MFR. INFO FOR REFERENCE)
Scale: N.T.S.



10 ROOFING DETAILS (MFR. INFO FOR REFERENCE)
Scale: N.T.S.

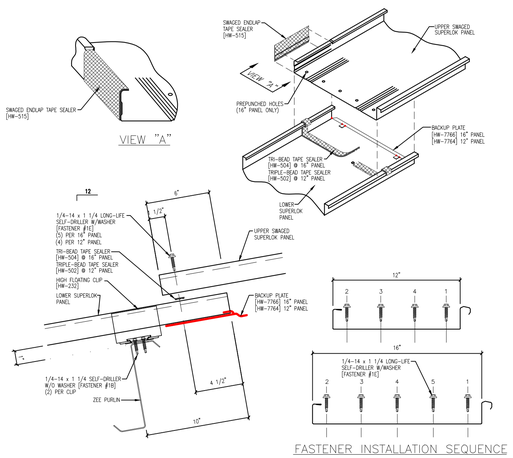


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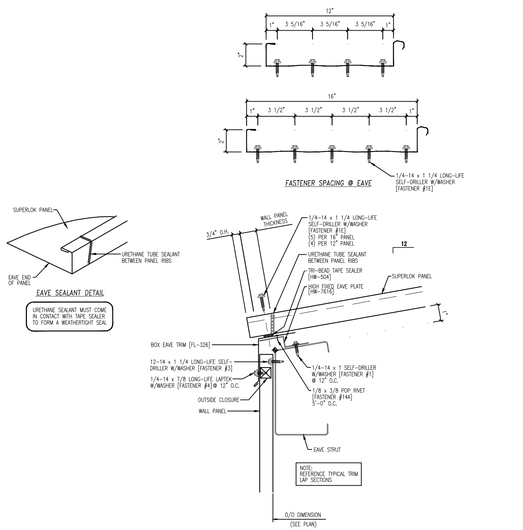
GENERAL ROOFING NOTES

1. VERIFY DIMENSIONS AND EXISTING CONDITIONS BEFORE COMMENCING WORK. REPORT DISCREPANCIES TO THE ARCHITECT PRIOR TO PROCEEDING WITH AFFECTED WORK.
2. DIMENSIONS NOTED AS "FIELD VERIFY" SHALL BE CHECKED AT THE SITE BY THE CONTRACTOR AND REVIEWED WITH THE ARCHITECT BEFORE INCORPORATING INTO THE WORK.
3. ALL TRIM WORK WORK IRRESPECTIVE OF ROOF TYPE: FACIA, RAKE, EAVE AND GUTTERS SHALL BE COORDINATED IN ALL ASPECTS – DIMENSIONS, BENDS AND DRIPS.
4. INSULATION AND LINER SYSTEM NOT SHOWN FOR CLARITY. REFERENCE SPECIFICATIONS FOR METAL BUILDING INSULATION AND LINER SYSTEM.

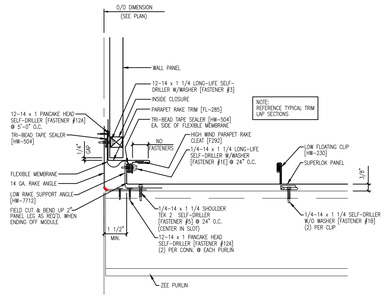
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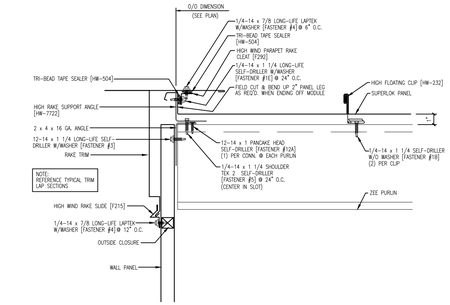
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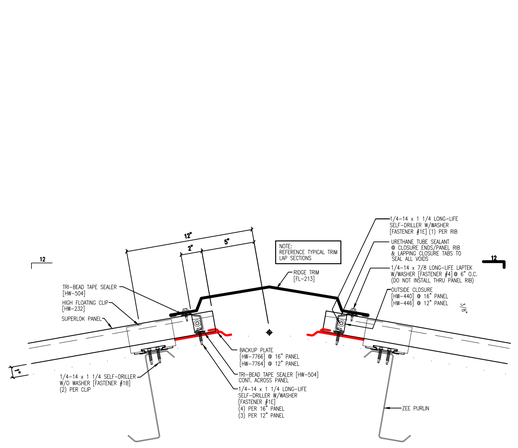
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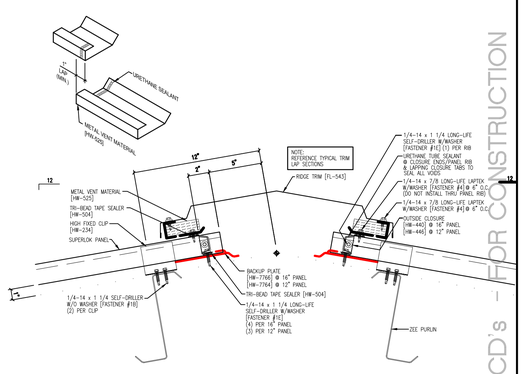
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Scale: N.T.S.



6 ROOFING DETAILS (MFR. INFO FOR REFERENCE)
Scale: N.T.S.



2 ROOFING DETAILS (MFR. INFO FOR REFERENCE)
Scale: N.T.S.



1 ROOFING -MTL. DETAILS (MFR. INFO FOR REF.)
Scale: N.T.S.

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REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX: (956) 464-8259

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WESLACO, TX 78596
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FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ENRIQUE ALVARADO III STATE OF TEXAS

DATE: 11/06/2020

DRAWING TITLE: ROOF DETAILS

FILE NAME:

JOB NO.: 1718

DATE: 11/06/2020

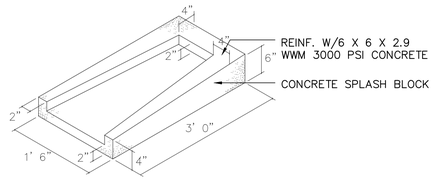
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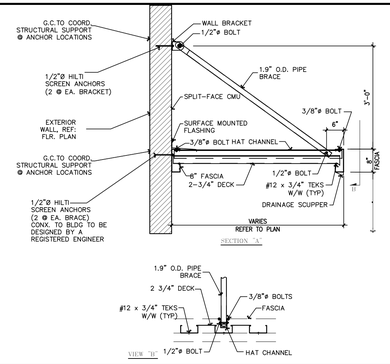
CHECKED BY: E.A. II/ E.A. III

SHEET: A3.01

GENERAL ROOFING NOTES

1. VERIFY DIMENSIONS AND EXISTING CONDITIONS BEFORE COMMENCING WORK. REPORT DISCREPANCIES TO THE ARCHITECT PRIOR TO PROCEEDING WITH AFFECTED WORK.
2. DIMENSIONS NOTED AS "FIELD VERIFY" SHALL BE CHECKED AT THE SITE BY THE CONTRACTOR AND REVIEWED WITH THE ARCHITECT BEFORE INCORPORATING INTO THE WORK.
3. ALL TRIM WORK WORK IRRESPECTIVE OF ROOF TYPE: FACIA, RAKE, EAVE AND GUTTERS SHALL BE COORDINATED IN ALL ASPECTS – DIMENSIONS, BENDS AND DRIPS.





20 NOT USED
Scale: N.T.S.

19 GENERAL ROOFING NOTES
Scale: N.T.S.

18 CONCRETE SPLASH BLOCK DETAIL
Scale: N.T.S.

17 MTL. AWNING DETAIL
Scale: N.T.S.

16 NOT USED
Scale: N.T.S.

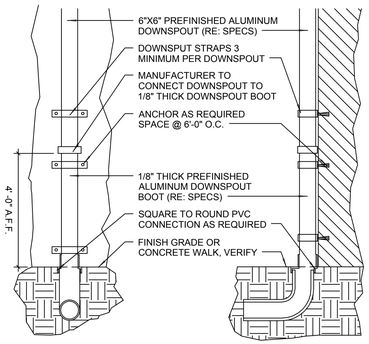
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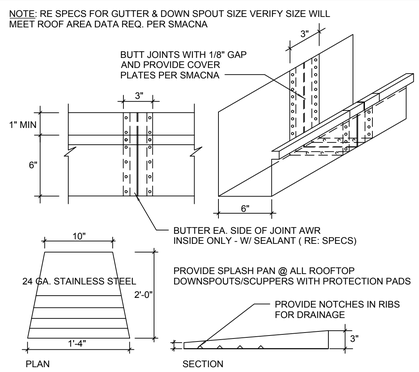
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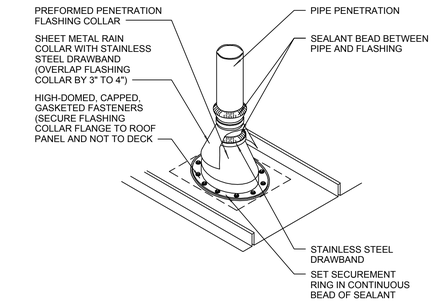
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Scale: N.T.S.

12 NOT USED
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11 NOT USED
Scale: N.T.S.







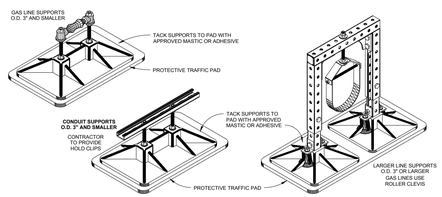
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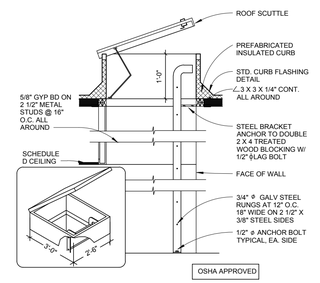
9 NOT USED
Scale: N.T.S.

8 ROOFING - DOWNSPOUT TO BOOT
Scale: N.T.S.

7 GUTTER JOINT AND SPLASH PANS
Scale: N.T.S.

6 ROOFING (METAL) - PLUMBING STACK
Scale: N.T.S.





5 NOT USED
Scale: N.T.S.

4 PIPE SUPPORT STANDS
Scale: N.T.S.

3 NOT USED
Scale: N.T.S.

2 NOT USED
Scale: N.T.S.

1 ROOF HATCH DETAIL
Scale: N.T.S.

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REVISIONS

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ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT STATE OF TEXAS

DATE: 11/06/20

DRAWING TITLE: ROOF DETAILS

FILE NAME:

JOB NO.: 1718

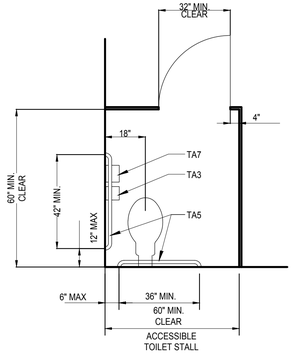
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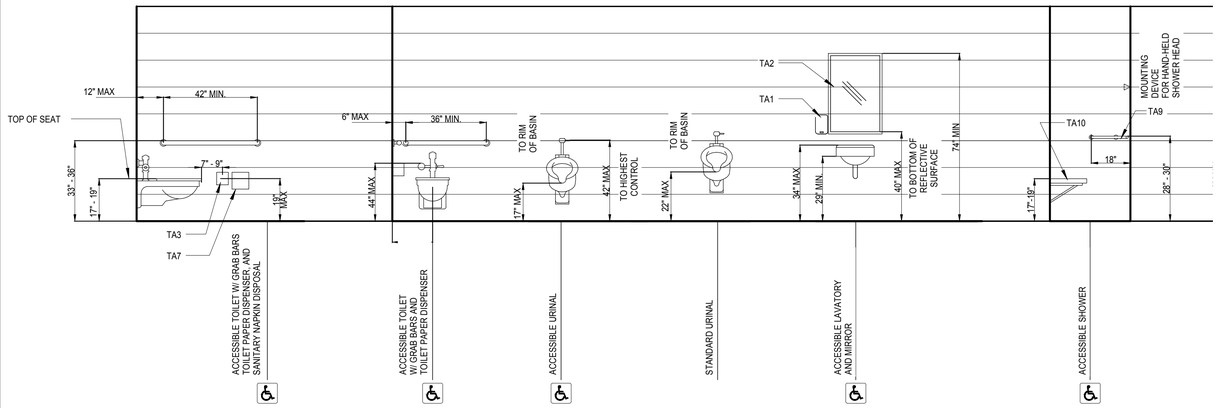
CHECKED BY: E.A. II/ E.A. III

SHEET: A3.02

NOTE: ALL FIXTURE SIZES , MOUNTING HEIGHTS, AND CLEARANCES MUST ABIDE BY THE TEXAS ACCESSIBILITY STANDARDS.



15 ACCESSIBLE STALL LAYOUT - TYP.
Scale: N.T.S.

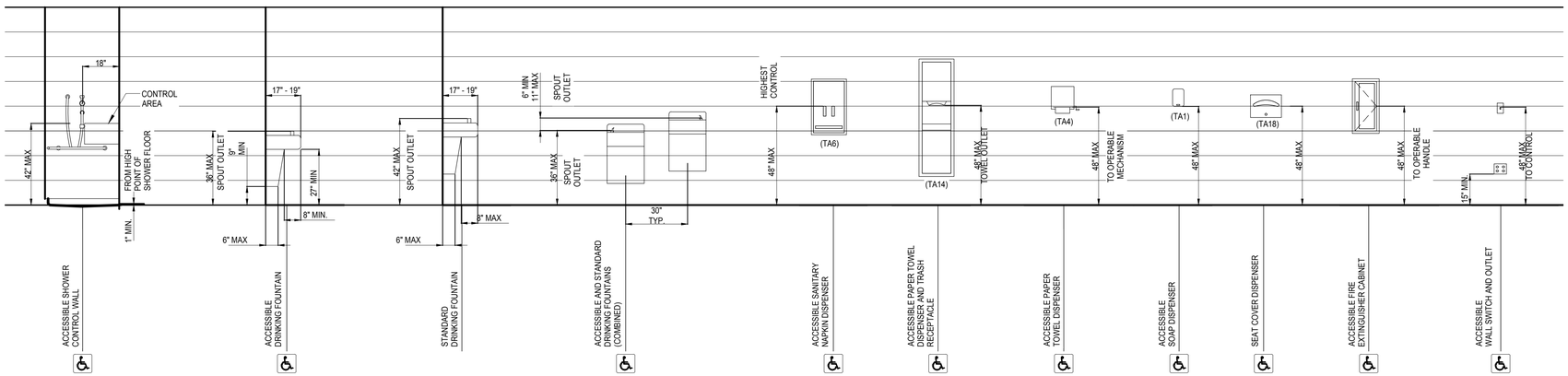


14 MOUNTING HEIGHTS - TYPICAL
Scale: N.T.S.

TOILET ACCESSORY LEGEND

LABEL	DESCRIPTION	REMARKS
TA1	SOAP DISPENSER	
TA2	24" X 48" MIRROR	
TA3	TOILET PAPER DISPENSER	
TA4	PAPER TOWEL DISPENSER	
TA5	GRAB BARS AT TYPICAL H.C. TOILET STALL	
TA6	SANITARY NAPKIN DISPENSER	
TA7	SANITARY NAPKIN DISPOSAL	
TA8	MOP & BROOM HOLDER	
TA9	GRAB BARS AT ACCESSIBLE SHOWER	
TA10	FOLDING SHOWER BENCH	
TA11	CLOTHES HOOK	
TA12	SHOWER CURTAIN, ROD AND HOOKS	
TA13	ELECTRIC HAND DRYER	
TA14	COMBO PAPER TOWEL DISPENSER/TRASH RECEPTACLE	
TA15	GRAB BARS AT ALTERNATE ACCESSIBLE TOILET STALL	
TA16	CHANGING STATION	
TA17	60" X 36" MIRROR	
TA18	SEAT COVER DISPENSER	

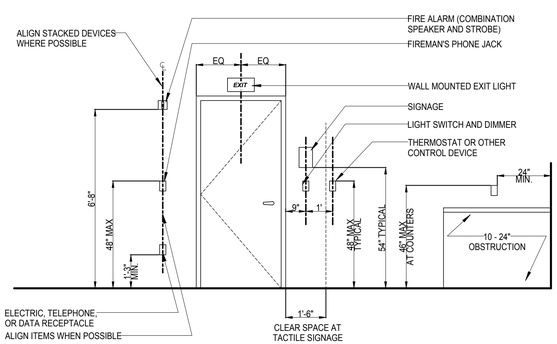
11 LEGEND
Scale: N.T.S.



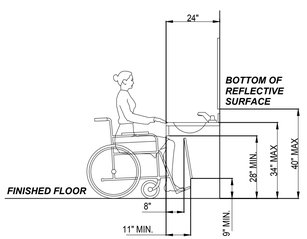
10 MOUNTING HEIGHTS - TYPICAL
Scale: N.T.S.

DESCRIPTION

DESCRIPTION	TEXAS AGES: ADULT
WATER CLOSET:	
TO TOP OF SEAT	17" - 19"
TO GRAB BARS	33" - 36"
URINAL:	
MAX TO RIM OF BASIN	17"
MAX TO FLUSH CONTROLS	48"
LAVATORIES (FRONTAL APPROACH):	
MIN KNEE CLEARANCE	29"
MAX TO TOP	34"
MAX TO FAUCETS FROM FRONT OF LAVATORY	22"
FIXED OR BUILT-IN:	
HEIGHT OF TABLES OR COUNTER	28" - 34"
MAX KNEE CLEARANCE	27"
SHELVES & DISPENSERS: MAX HEIGHT TO CONTROL DEVICE	
MAX FRONTAL APPROACH	48"
MAX SIDE APPROACH	54"
DRINKING FOUNTAINS:	
MAX TO SPOUT	36"
MIN KNEE CLEARANCE	27"
SWITCHES AND CONTROLS:	
MAX FRONTAL APPROACH	48"
MAX SIDE APPROACH	54"
MIRROR (MAX TO BOTTOM OF REFLECTIVE SURFACE):	40" MAX
TOILET PAPER DISPENSER (MIN TO CENTER OF ROLL):	19"
PAPER TOWEL DISPENSER (TO OPERATING MECHANISM):	48"
SHOWER:	
TOP OF FOLDING BENCH	17" - 19"
TO GRAB BAR	33" - 36"
MAX TO HAND SHOWER HEAD MOUNTING	48"
MARKERBOARDS/TACKBOARDS/SMARTBOARDS:	36" TO BOTTOM



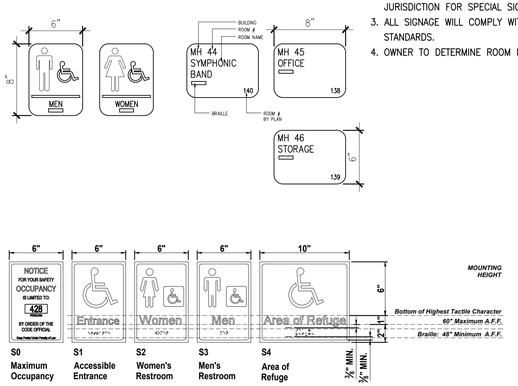
5 MISCELLANEOUS HEIGHTS
Scale: N.T.S.



4 ACCESSIBLE VANITY
Scale: N.T.S.

GENERAL SIGNAGE NOTES

1. ALL SPACES TO RECEIVE SIGNAGE. REFER TO SPECS.
2. G.C. TO COORDINATE WITH AUTHORITIES HAVING JURISDICTION FOR SPECIAL SIGNAGE REQUIREMENTS.
3. ALL SIGNAGE WILL COMPLY WITH TEXAS ACCESSIBILITY STANDARDS.
4. OWNER TO DETERMINE ROOM NAME AND NUMBER.



3 TYPICAL SIGNAGE
Scale: N.T.S.

1 MOUNTING HEIGHTS
Scale: N.T.S.

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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ENRIQUE ALVARADO JR. 23452 STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE:
TAS - ACCESSIBLITY DETAILS

FILE NAME:

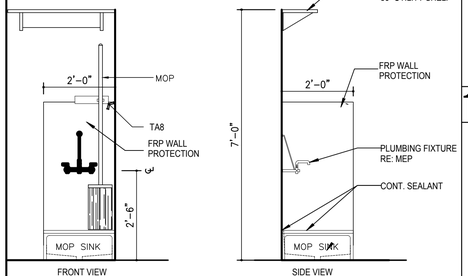
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DATE: 11/06/2020

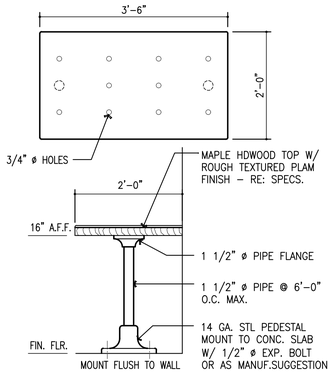
DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

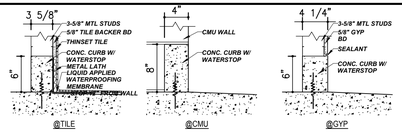
SHEET: A4.00



20 MOP SINK DETAIL
Scale: 1/2" = 1'-0"



15 ACCESSIBLE BENCH DETAIL
Scale: 3/4" = 1'-0"



NOTE: CURB DETAIL APPLIES TO THREE SURROUND WALLS. OPENING IS TO BE ACCESSIBLE WITH STONE THRESHOLD. REF: SPECS.

14 SHOWER CURB DETAIL
Scale: 1" = 1'-0"

TOILET ACCESSORY LEGEND

LABEL	DESCRIPTION	REMARKS
TA1	SOAP DISPENSER	
TA2	24" X 48" MIRROR	
TA3	TOILET PAPER DISPENSER	
TA4	PAPER TOWEL DISPENSER	
TA5	GRAB BARS AT TYPICAL H.C. TOILET STALL	
TA6	SANITARY NAPKIN DISPENSER	
TA7	SANITARY NAPKIN DISPOSAL	
TA8	MOP & BROOM HOLDER	
TA9	GRAB BARS AT ACCESSIBLE SHOWER	
TA10	FOLDING SHOWER BENCH	
TA11	CLOTHES HOOK	NOTE 7
TA12	SHOWER CURTAIN, ROD AND HOOKS	NOTE 7
TA13	ELECTRIC HAND DRYER	
TA14	COMBO PAPER TOWEL DISPENSER/TRASH RECEPTACLE	
TA15	GRAB BARS AT ALTERNATE ACCESSIBLE TOILET STALL	
TA16	CHANGING STATION	
TA17	60" X 36" MIRROR	
TA18	SEAT COVER DISPENSER	

***NOTE:** ALL TOILET ACCESSORIES SHALL BE CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED OTHERWISE. NOT ALL FIXTURES LISTED SHALL BE USED.*

1. COORDINATE FINAL LOCATIONS WITH ARCHITECT PRIOR TO INSTALLATION.

2. CONTRACTOR IS TO VERIFY ALL HEIGHTS OF ACCESSORIES TO COMPLY WITH TEXAS ARCHITECTURAL BARRIERS.

3. REFER TO ALL FINISHES AND COLORS IN FINISH SCHEDULE (TBD). VERIFY ALL PATTERNS WITH ARCHITECT.

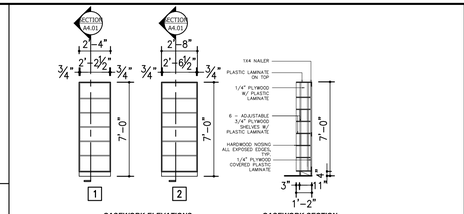
4. ALIGN MIRROR ON CENTER OF LAVATORY.

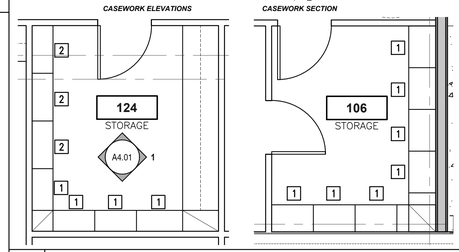
5. INSULATE ALL EXPOSED PLUMBING PIPES.

6. VERIFY LOCATIONS OF ACCESS PANELS WITH ARCHITECT PRIOR TO INSTALLATION.

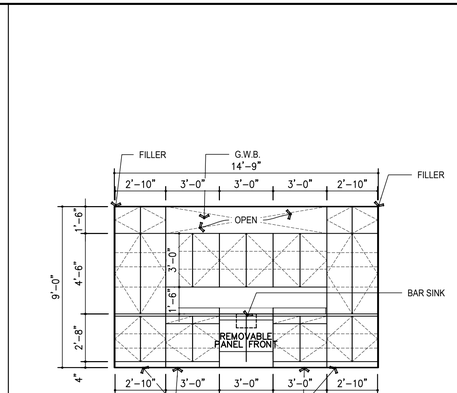
7 ONE HOOK INSIDE DOOR AT EACH TOILET PARTITION. ONE HOOK INSIDE DOOR AT SINGLE TOILET ROOMS AND ONE HOOK AT EACH SHOWER.

14 LEGEND
Scale: N.T.S.

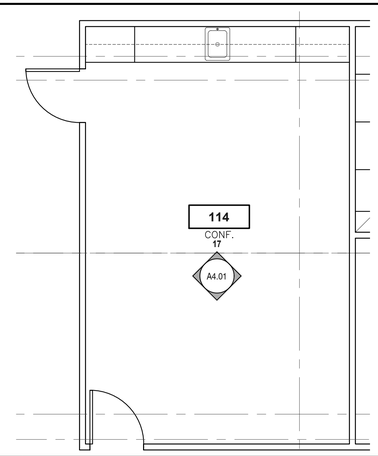




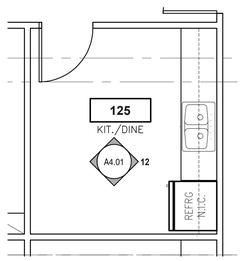
18 ENLARGED STORAGE PLAN
Scale: 1/4" = 1'-0"



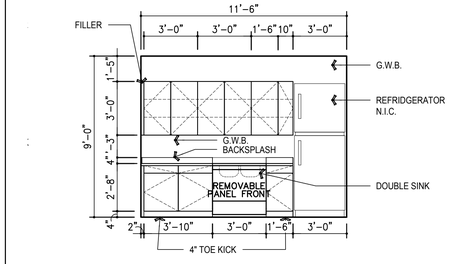
17 INTERIOR ELEVATION - CONF.
Scale: 1/4" = 1'-0"



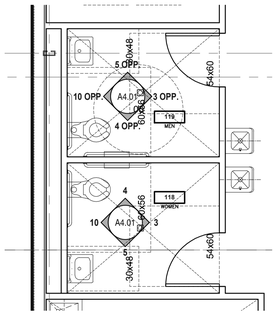
16 ENLARGED CONFERENCE PLAN
Scale: 1/4" = 1'-0"



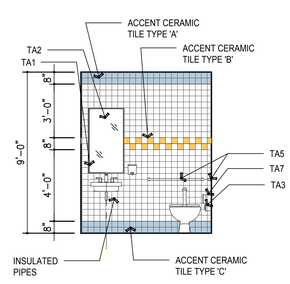
13 ENLARGED KITCHEN PLAN
Scale: 1/4" = 1'-0"



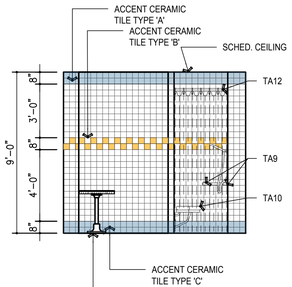
12 INTERIOR ELEVATION - KITCHEN
Scale: 1/4" = 1'-0"



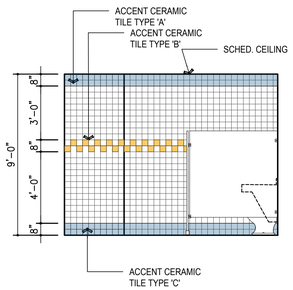
11 PLAN ENLARGMENT AT RESTROOMS
Scale: 1/4" = 1'-0"



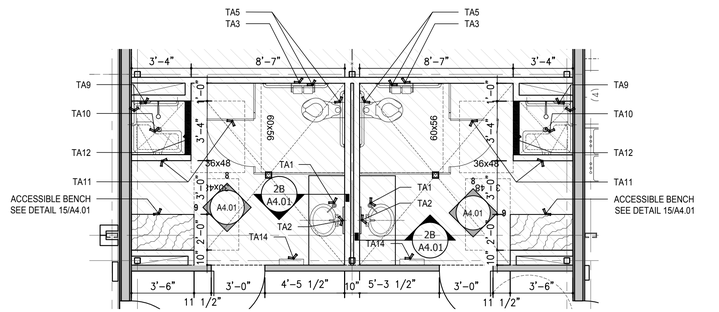
10 INTERIOR ELEVATION - RESTROOM
Scale: 1/4" = 1'-0"



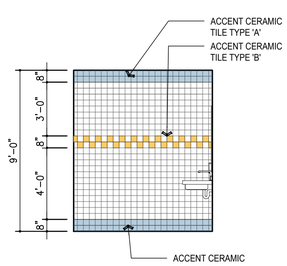
9 DETAIL
Scale: 1/4" = 1'-0"



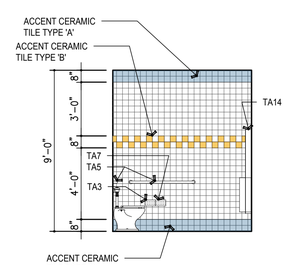
8 ELEVATION
Scale: 1/4" = 1'-0"



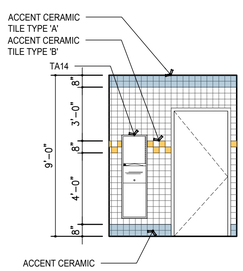
7 ENLARGED RESTROOM PLAN
Scale: N.T.S.



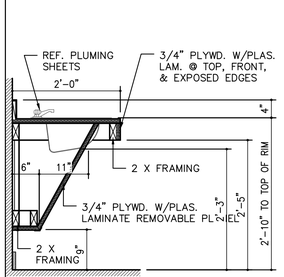
5 INTERIOR ELEVATION - RESTROOM
Scale: 1/4" = 1'-0"



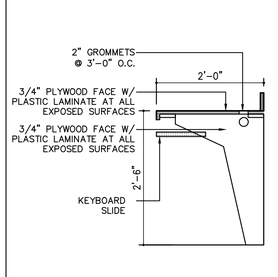
4 INTERIOR ELEVATION - RESTROOM
Scale: 1/4" = 1'-0"



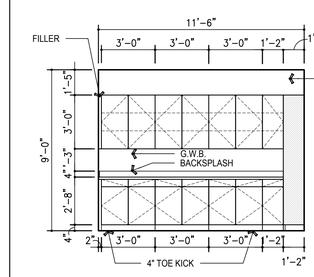
3 INTERIOR ELEVATION - RESTROOM
Scale: 1/4" = 1'-0"



2B LAV. SECTION
Scale: 3/4" = 1'-0"



2A COUNTER SECTION
Scale: 3/4" = 1'-0"



1 INT. ELEVATION - STORAGE
Scale: 1/4" = 1'-0"

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-4477

REVISIONS

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/2020

DRAWING TITLE:
ENLARGED RESTROOM PLANS

FILE NAME:

JOB NO.: 1718

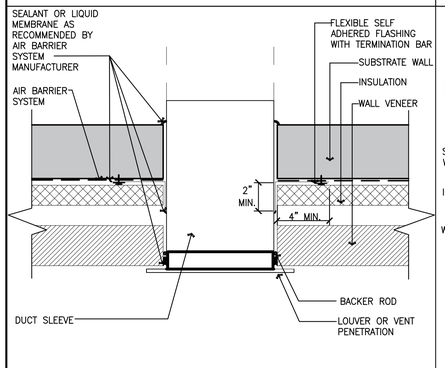
DATE: 11/06/2020

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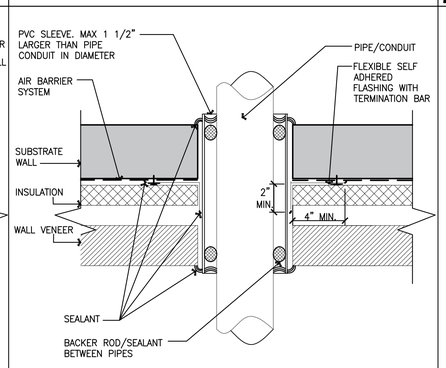
CHECKED BY: E.A. II/ E.A. III

SHEET: A4.01

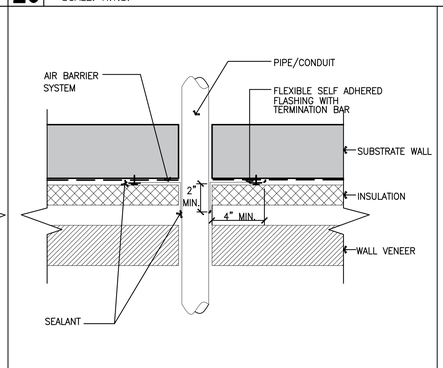
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17 DUCT WALL PENETRATION



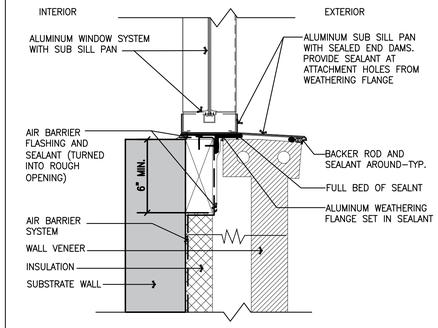
16 SLEEVE PIPE WALL PENETRATION



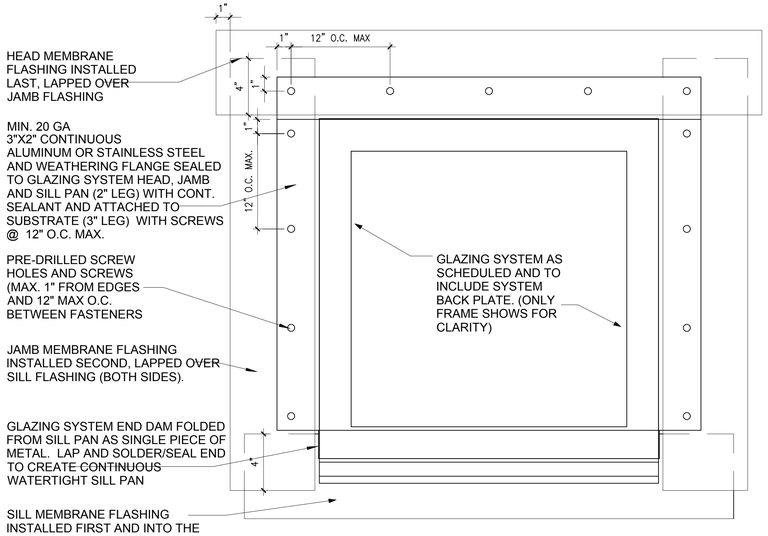
15 PIPE/CONDUIT WALL PENETRATION

1. ALL DETAILS ARE INTENDED TO INDICATE GENERIC SUBSTRATE FLASHING/SEALING OF EXTERIOR BUILDING ENVELOPE CONDITIONS. EXACT CONDITIONS AND DETAILS WILL VARY. REFER ALSO TO ARCHITECTURAL DOOR AND OTHER WALL PENETRATION OPENINGS FOR ADDITIONAL NOTES AND FINISHES.
2. ALL DETAILS ARE INTENDED TO CONVEY THE BUILDING CODE REQUIREMENTS OF A SEALED BUILDING ENVELOPE. OTHER PROJECT CONDITIONS MAY DICTATE DIFFERING DETAILS, HOWEVER A SEALED BUILDING ENVELOPE IS TO BE MAINTAINED.
3. ALL DETAILS ARE INDICATED WITH NOTE TO REMOVE ADJACENT MATERIALS ARE INTENDED TO ALSO BE UNTILIZED ON NEW CONSTRUCTION CONDITIONS.
4. ALL LAPS AND EXPOSED EDGES OF FLEXIBLE SELF ADHERED FLASHING ARE TO BE SEALED ACCORDING TO MANUFACTURERS WRITTEN INSTRUCTIONS.
5. EXPOSED EDGES OF SELF-ADHERED FLASHING ARE NOT TO BE INSTALLED IN CONTACT WITH POLYURETHANE SEALANTS EXPOSED TO VIEW.
6. AIR BARRIER SYSTEM IS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS, ALL BARRIER, FLASHING AND TRANSITION MATERIALS SHALL BE COMPATIBLE WITH ONE ANOTHER AND CONSTITUTE THE AIR BARRIER SYSTEM.

14 GENERAL NOTES

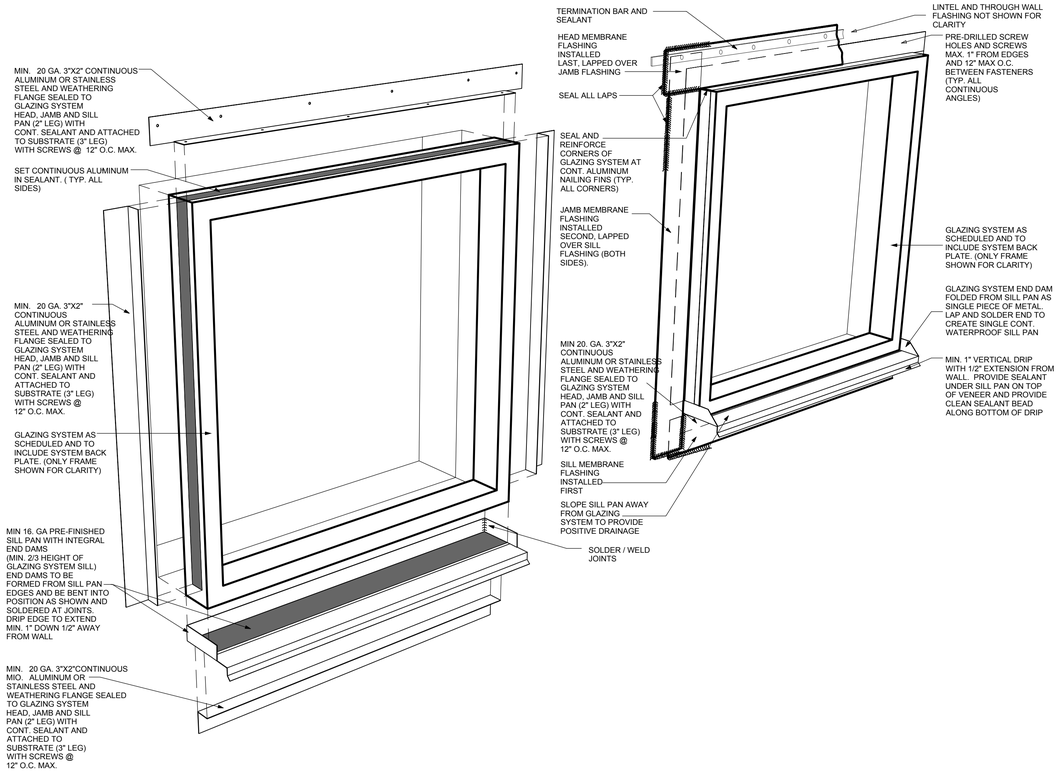


13 SILL FLASHING - ALUM. FRAME

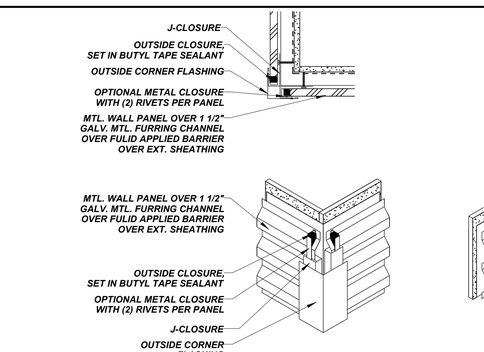


PRIOR TO WINDOW FRAME BEING SET, INSTALL FLEXIBLE SELF-ADHERED FLASHING ON WOOD BLOCKING AND INTO THE ROUGH OPENING AT HEAD, JAMB AND SILL LOCATIONS.

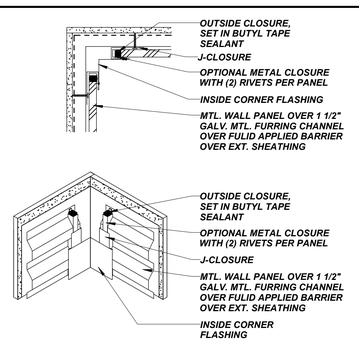
5 STOREFRONT ELEVATION - EDGE CONDITION



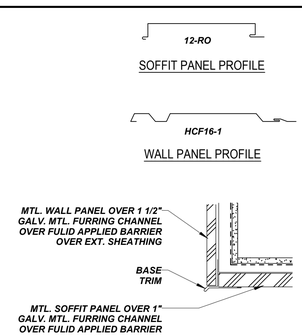
3 EXPLODED VIEWS OF WINDOW FLASHINGS (DOORS SIMILAR)



OUTSIDE CORNER



INSIDE CORNER



VERT. WALL TO SOFFIT

REVISIONS

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STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT EDWARD ALVARADO 23743 STATE OF TEXAS
DATE: 11/06/20

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DRAWING TITLE:
TYPICAL BUILDING ENVELOPE DETAILS

FILE NAME:

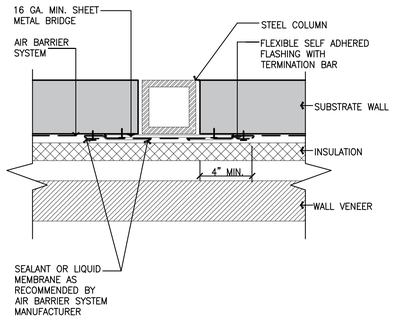
JOB NO.: 1718

DATE: 11/06/2020

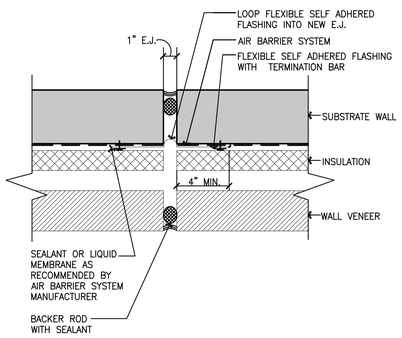
DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

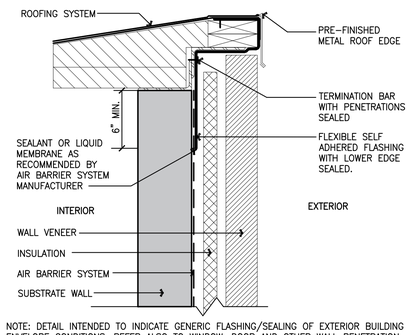
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29 STEEL COLUMN CONNECTION

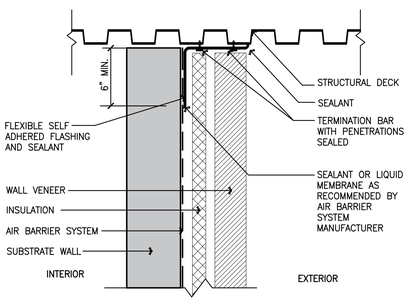


23 EXPANSION JOINT CONNECTION

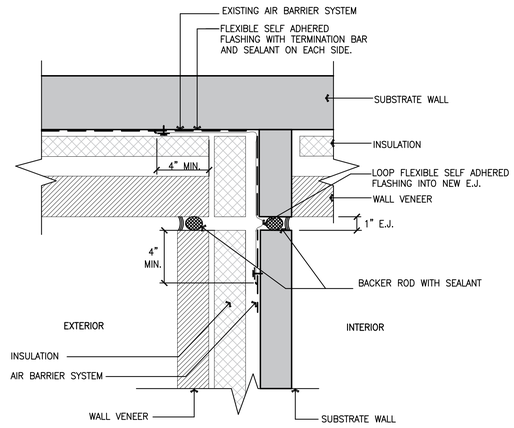


NOTE: DETAIL INTENDED TO INDICATE GENERIC FLASHING/SEALING OF EXTERIOR BUILDING ENVELOPE CONDITIONS. REFER ALSO TO WINDOW, DOOR AND OTHER WALL PENETRATION OPENINGS FOR ADDITIONAL NOTES AND FINISHES.

30 TOP OF WALL AT ROOF EDGE

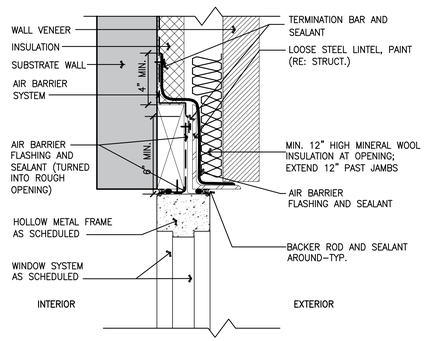


24 TOP OF WALL AT MTL. DECK

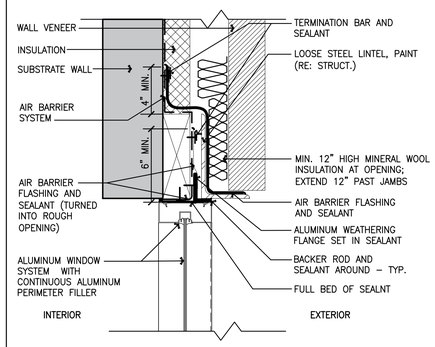


22 "T" CONNECTION EXPANSION JOINT

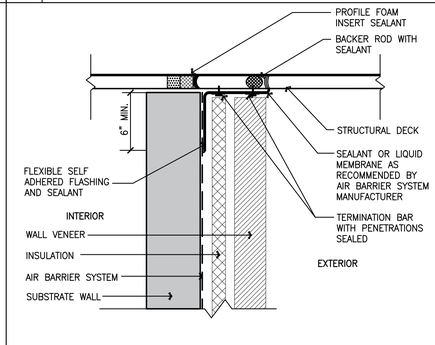
20 JAMB FLASHING - H.M. FRAME



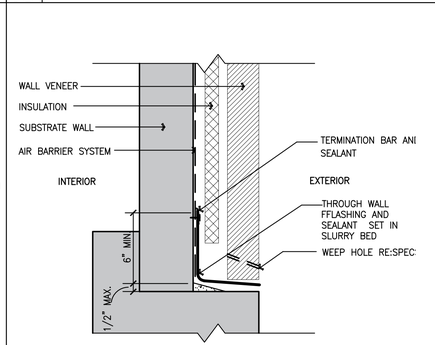
26 HEAD FLASHING - H.M. FRAME



25 HEAD FLASHING - ALUM. FRAME

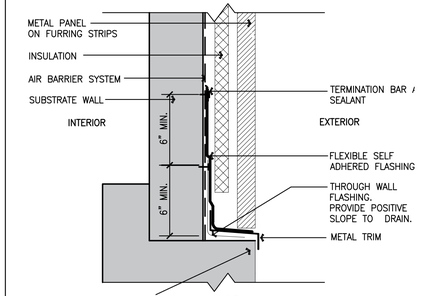


18 TOP OF WALL AT MTL. DECK



12 BASE OF MASONRY WALL

19 JAMB FLASHING - ALUM. FRAME



6 BASE OF METAL WALL PANEL

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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ... STATE OF TEXAS

DATE: 11/06/20

DRAWING TITLE:
TYPICAL BUILDING ENVELOPE DETAILS

FILE NAME:

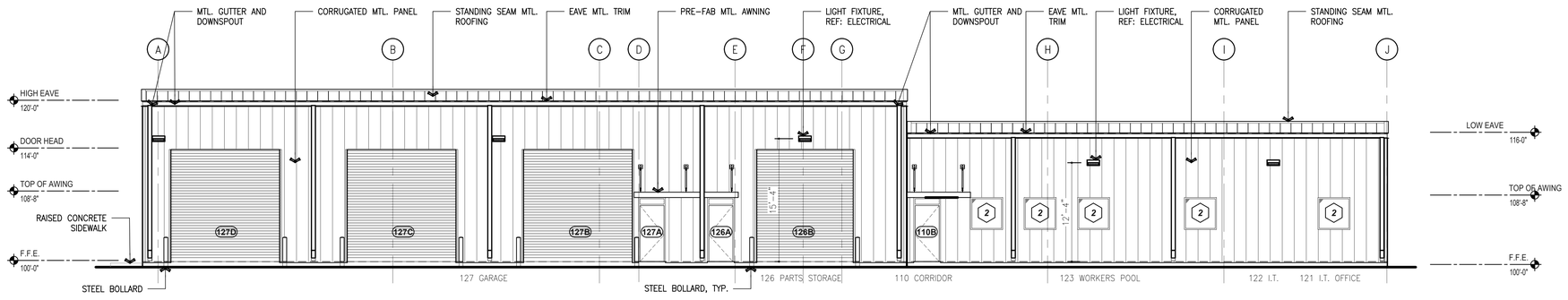
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DATE: 11/06/2020

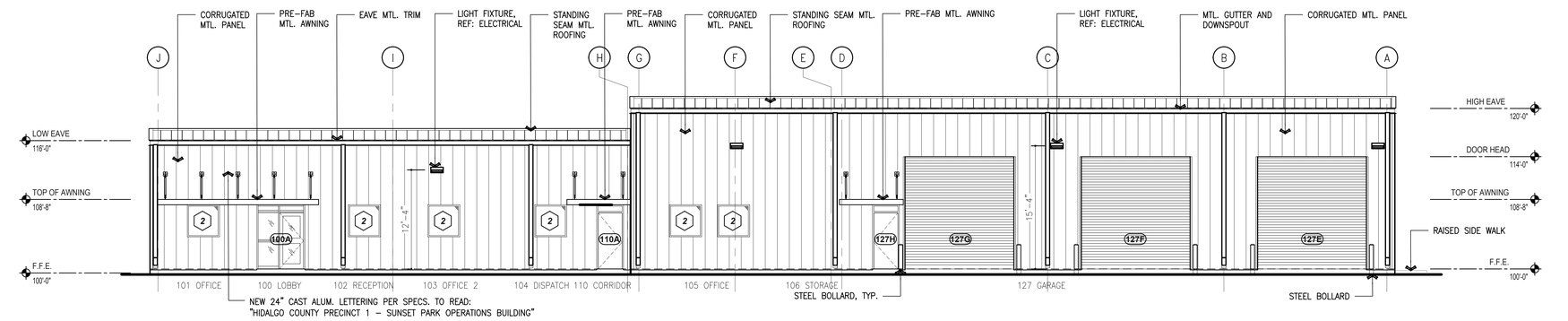
DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

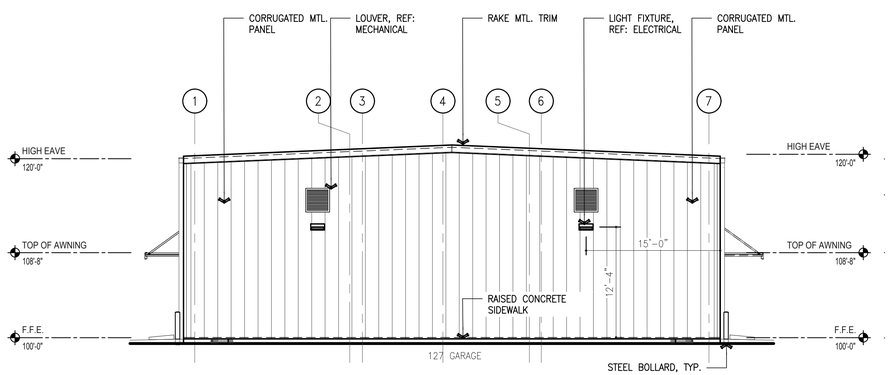
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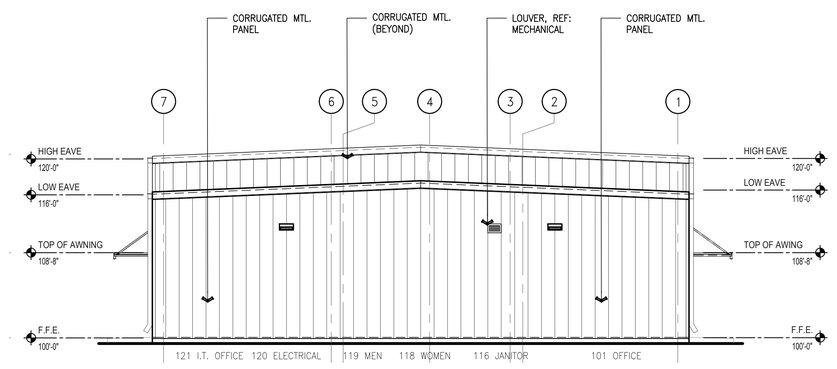
15 NORTH ELEVATION
Scale: 1/8" = 1'-0"



10 SOUTH ELEVATION
Scale: 1/8" = 1'-0"



5 WEST ELEVATION
Scale: 1/8" = 1'-0"



3 EAST ELEVATION
Scale: 1/8" = 1'-0"

100% CD's - FOR CONSTRUCTION

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ... STATE OF TEXAS

DATE: 11/06/20

DRAWING TITLE: ELEVATIONS

FILE NAME:

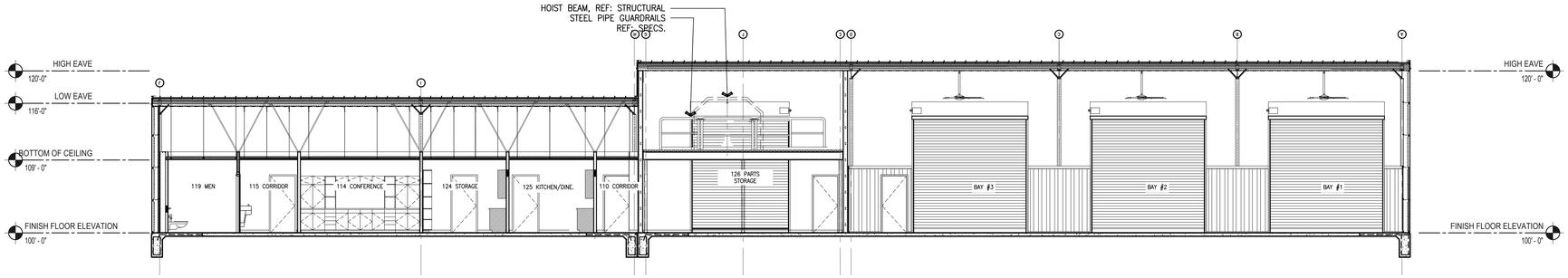
JOB NO.: 1718

DATE: 11/06/2020

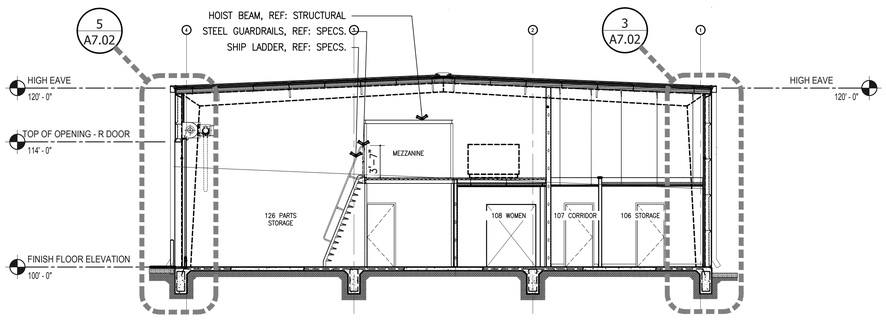
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CHECKED BY: E.A. II/ E.A. III

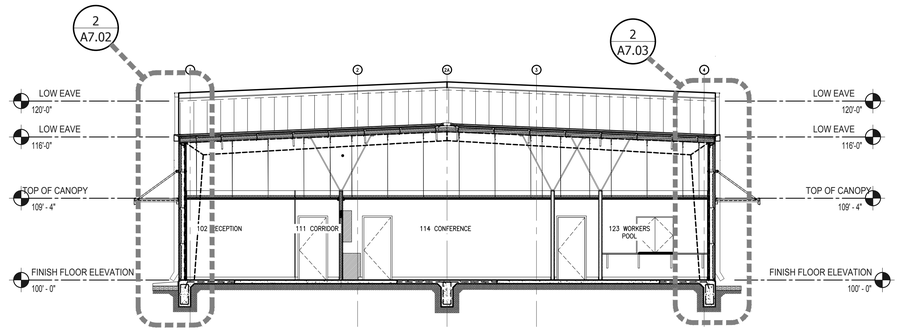
SHEET: A6.00



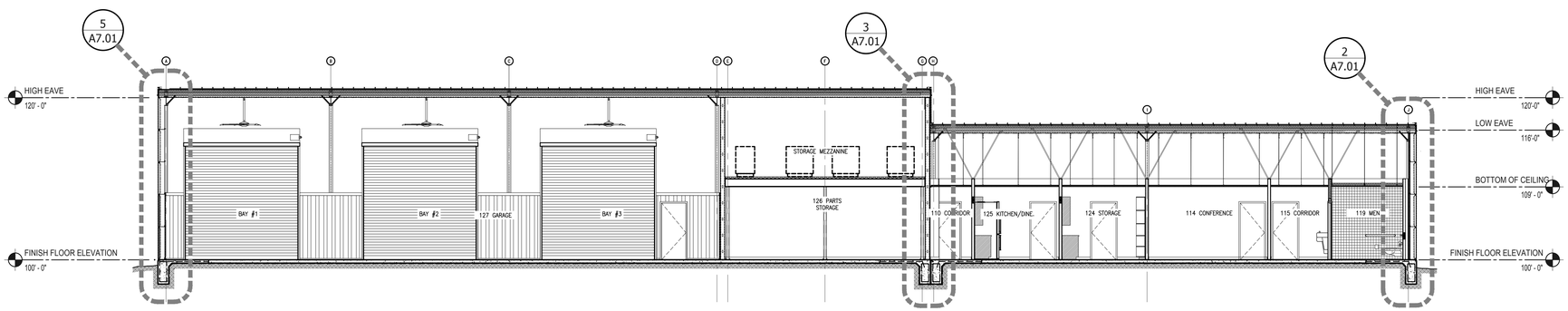
15 BUILDING SECTION
Scale: 1/8" = 1'-0"



10 BUILDING SECTION
Scale: 1/8" = 1'-0"



7 BUILDING SECTION
Scale: 1/8" = 1'-0"



5 BUILDING SECTION
Scale: 1/8" = 1'-0"

100% CD's - FOR CONSTRUCTION

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ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
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1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1477

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ENRIQUE ALVARADO III 24 STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE:
BUILDING SECTIONS

FILE NAME:

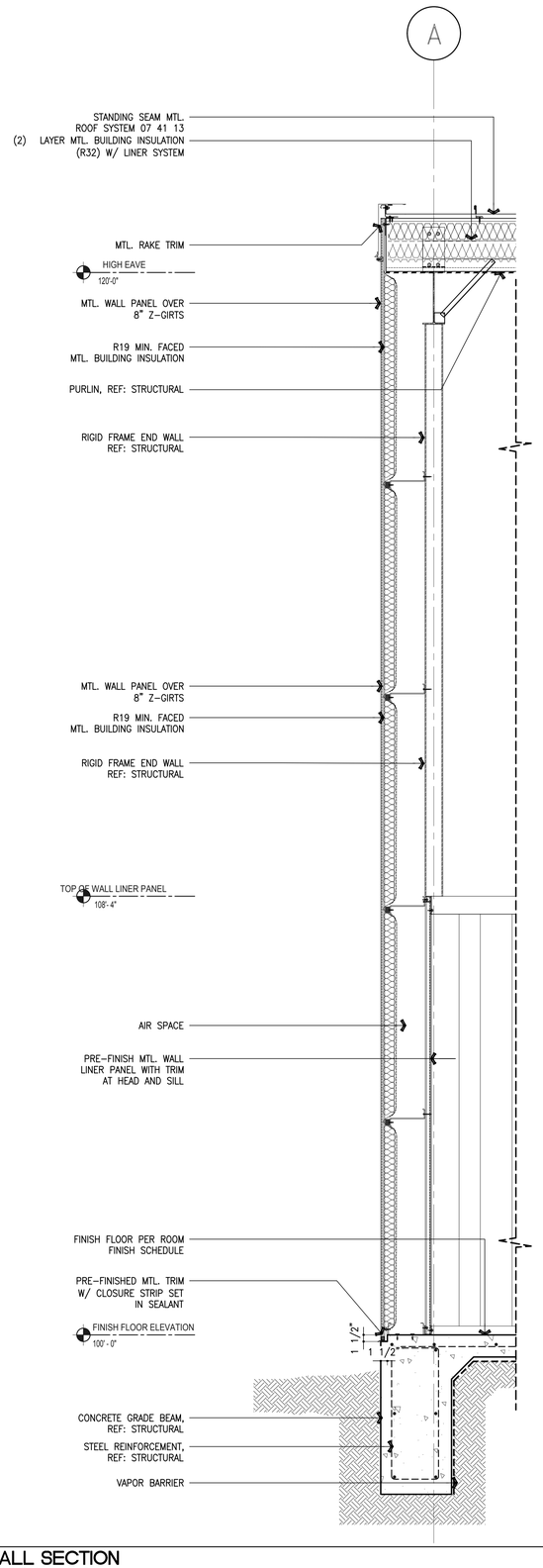
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DATE: 11/06/2020

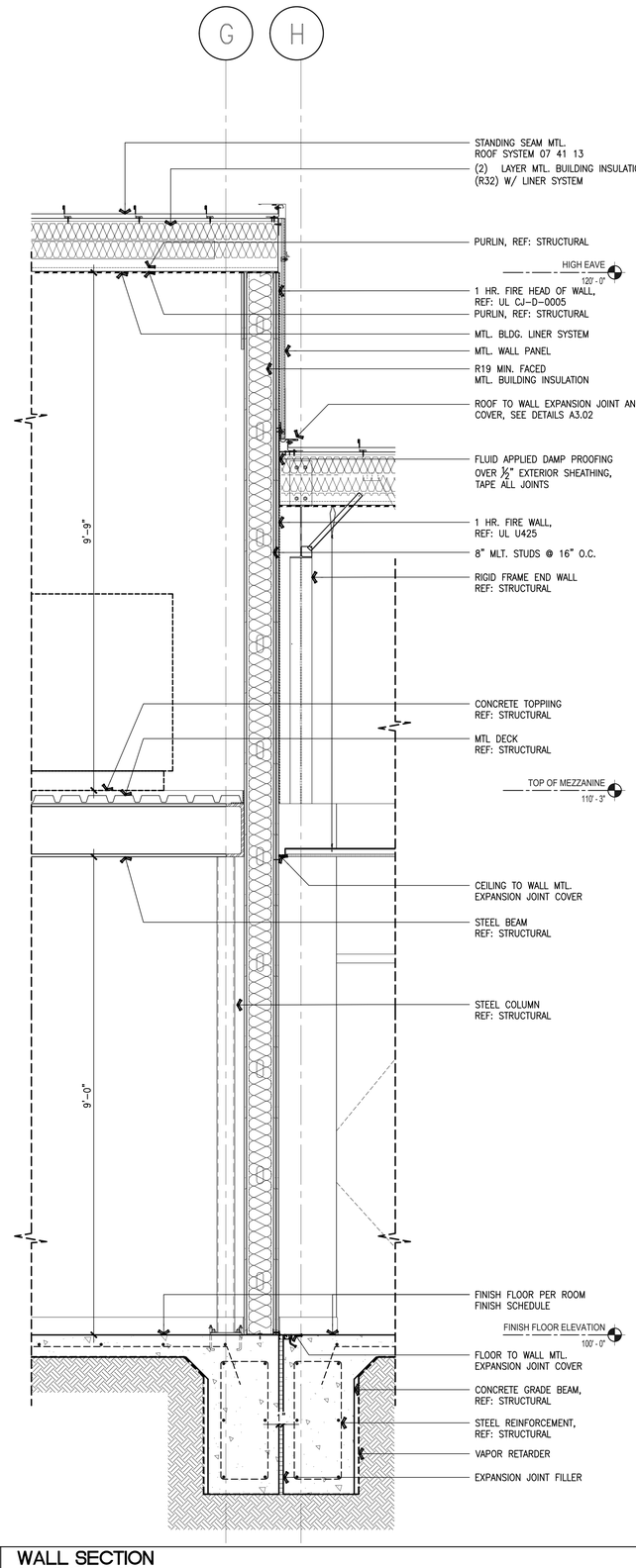
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CHECKED BY: E.A. II/ E.A. III

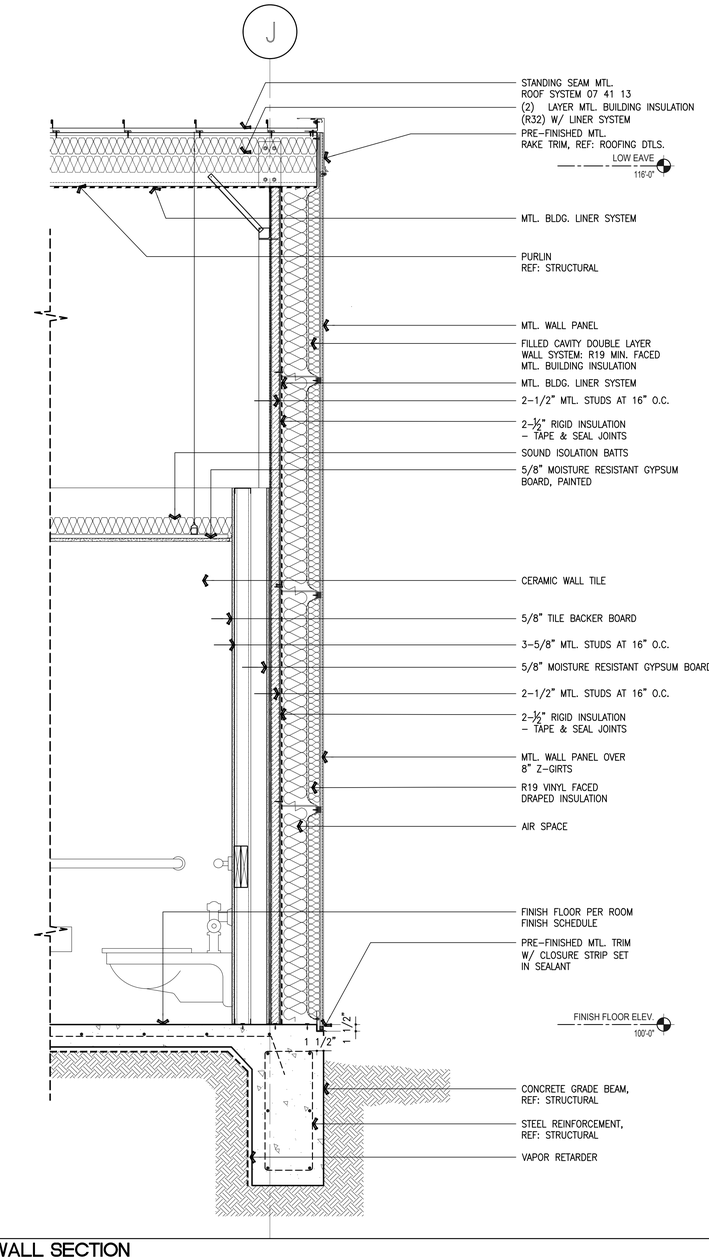
SHEET: A7.00



5 WALL SECTION
Scale: 3/4" = 1'-0"



3 WALL SECTION
Scale: 3/4" = 1'-0"



2 WALL SECTION
Scale: 3/4" = 1'-0"

100% CD's - FOR CONSTRUCTION

REVISIONS

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TEL. (956) 464-8258 FAX. (956) 464-8259

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WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-4417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/2020

DRAWING TITLE: WALL SECTIONS

FILE NAME:

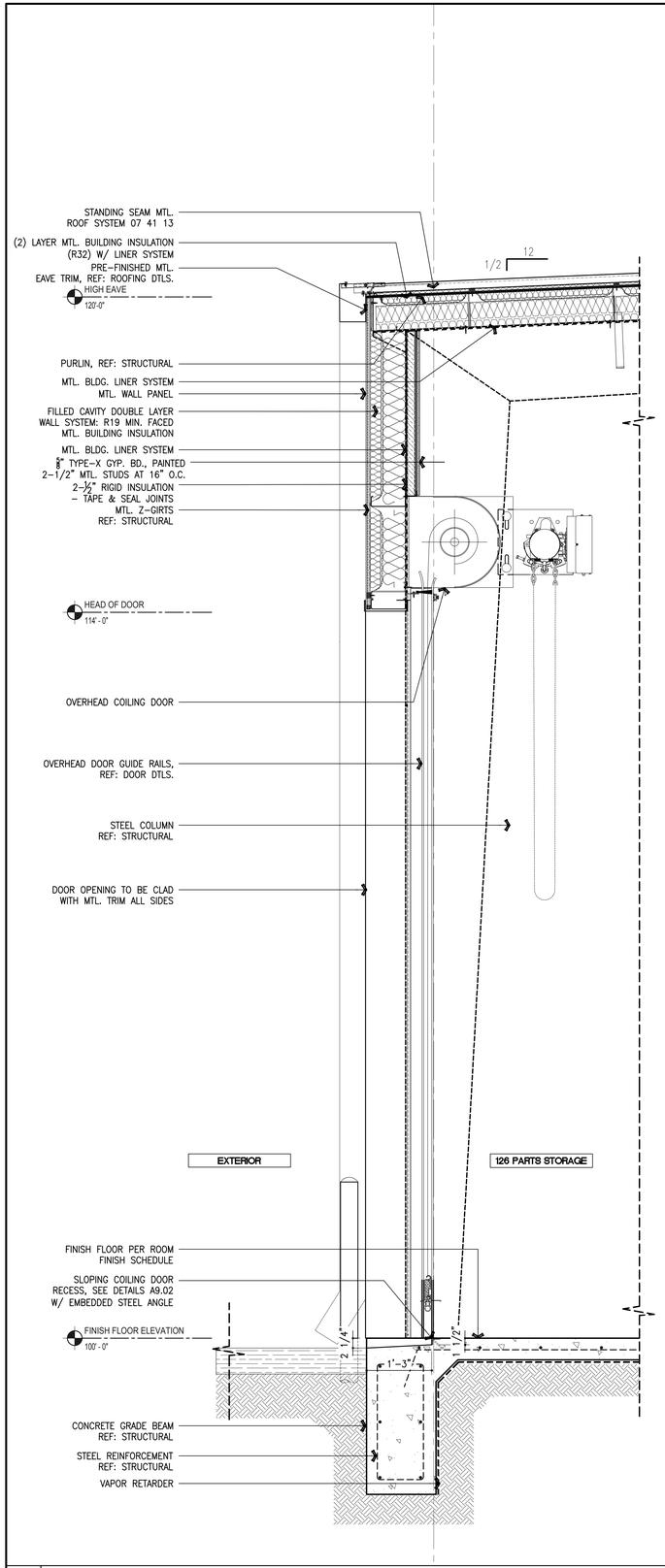
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DATE: 11/06/2020

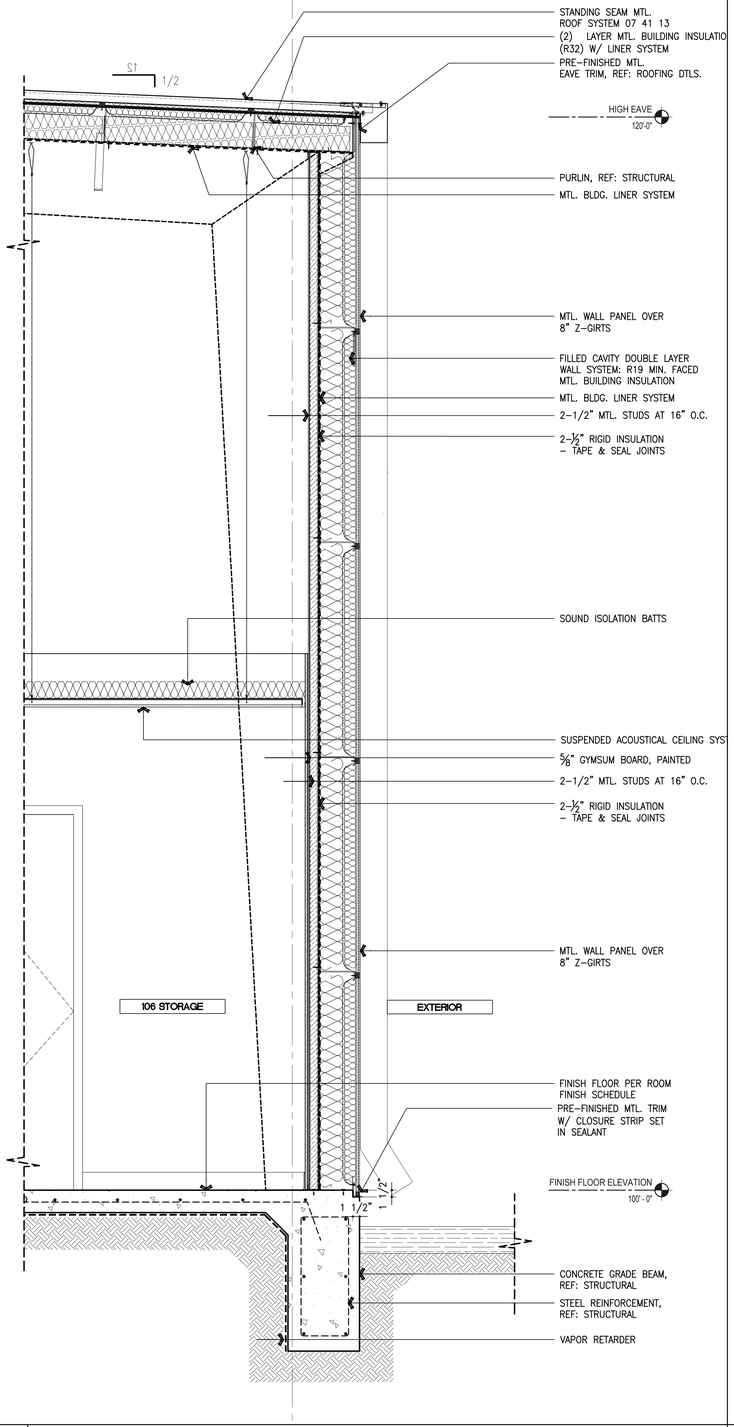
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CHECKED BY: E.A. II/ E.A. III

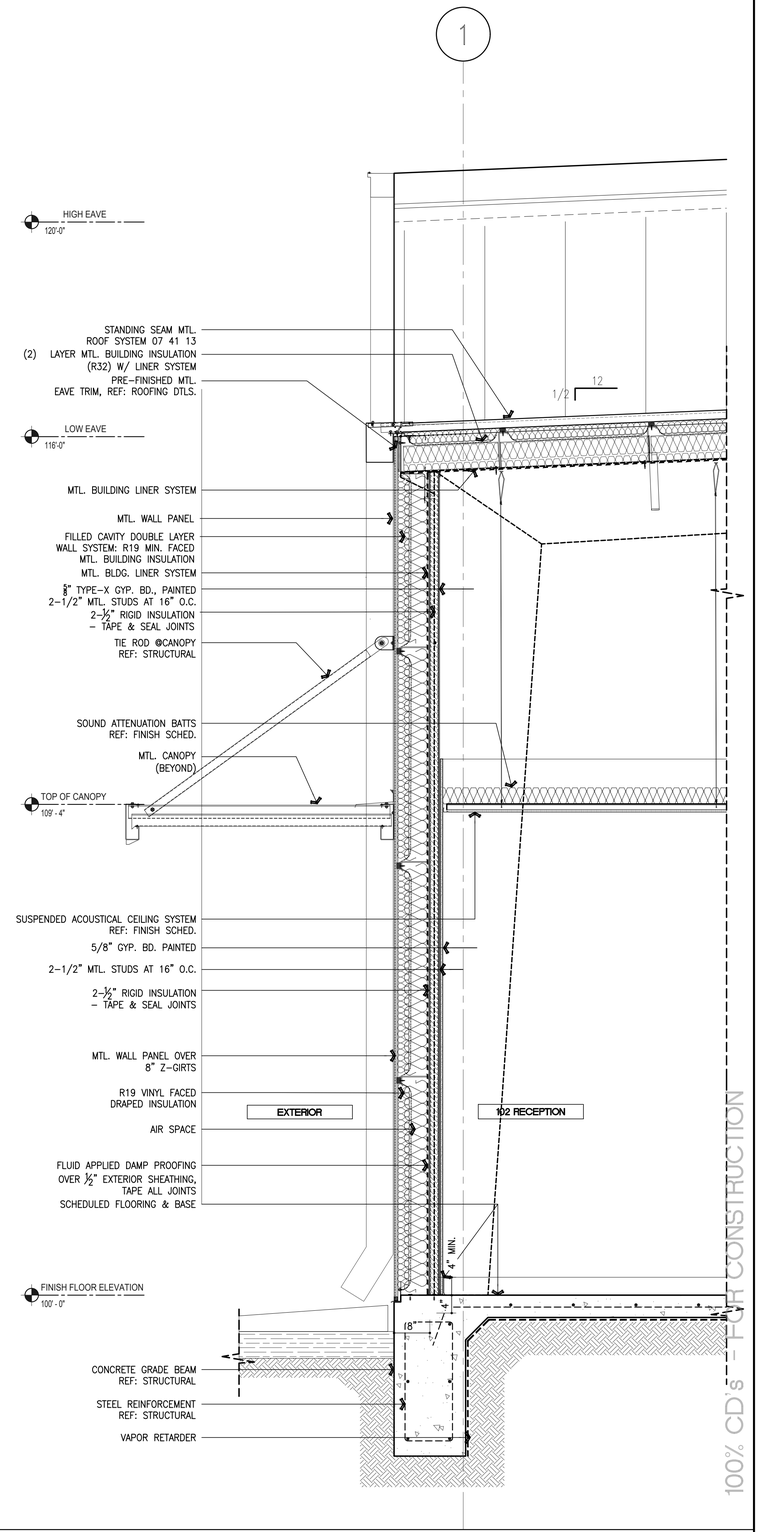
SHEET: A7.01



5 WALL SECTION
Scale: 3/4" = 1'-0"



3 WALL SECTION
Scale: 3/4" = 1'-0"



2 WALL SECTION
Scale: 3/4" = 1'-0"

100% CD's FOR CONSTRUCTION

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1902 JOE STEPHENS AVE.
STE. 101
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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ... STATE OF TEXAS ... DATE: 11/06/2020

DRAWING TITLE: WALL SECTIONS

FILE NAME:

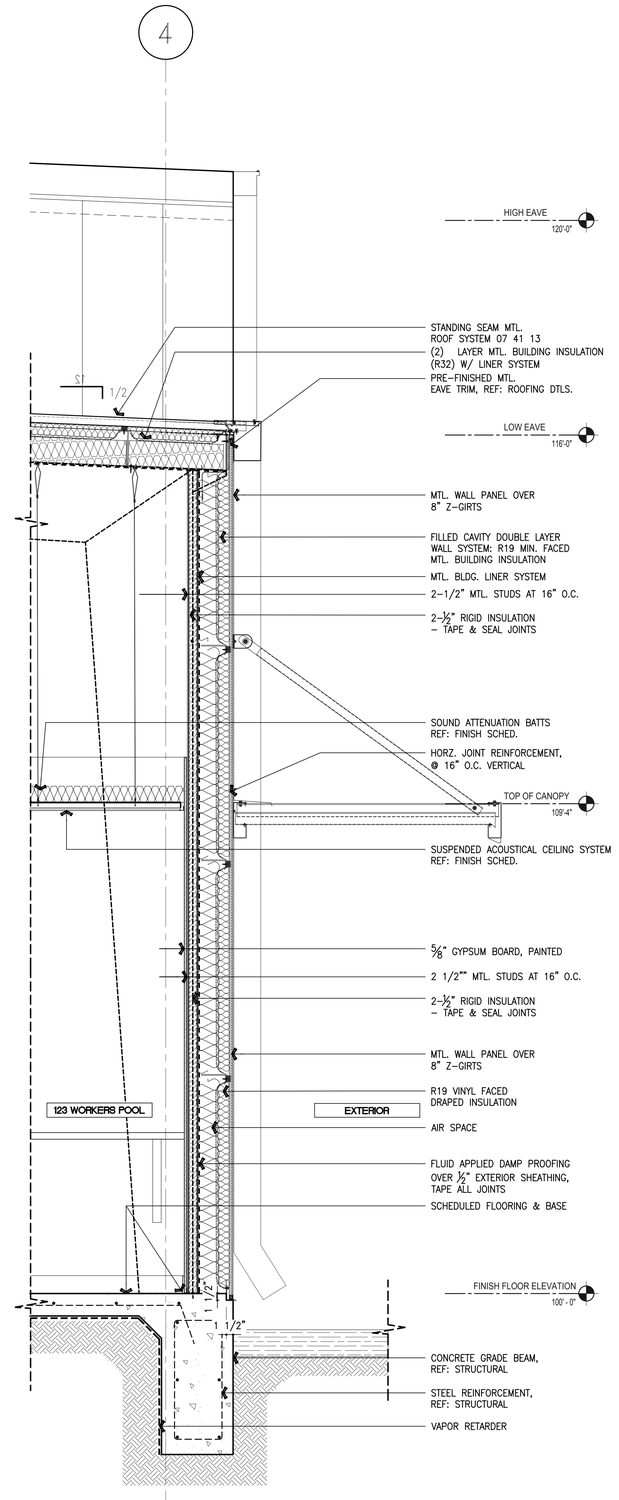
JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: A7.02



5 NOT USED
Scale: N.T.S.

3 NOT USED
Scale: N.T.S.

2 WALL SECTION
Scale: 3/4" = 1'-0"

100% CD's - FOR CONSTRUCTION

REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ... STATE OF TEXAS

DATE: 11/06/20

DRAWING TITLE:
WALL SECTIONS

FILE NAME:

JOB NO.:
1718

DATE:
11/06/2020

DRAWN BY:
MG

CHECKED BY:
E.A. II/ E.A. III

SHEET:
A7.03

BRACING NOTES:

1. AT WALLS THAT TERMINATE ABOVE CEILING, CONTRACTOR MAY CONTINUE METAL STUD FRAMED WALLS TO UNDERSIDE OF METAL DECK AND OMIT DIAGONAL BRACING IF HEIGHT DOES NOT EXCEED LIMITING HEIGHT OF METAL STUD AS INDICATED ON CHART BELOW.

2. PROVIDE INTERMEDIATE BRACING AT ALL PARTITIONS THAT EXCEED LIMITING HEIGHT OF METAL STUDS AS INDICATED ON CHART BELOW.

3. ALL BRACING SHALL BE AT STUD POINTS.

TERMINATION NOTES:

1. AT ALL RATED PARTITIONS, FILL VOIDS IN METAL DECK AT TOP OF PARTITIONS WITH FIRESAFING.

CMU PARTITION NOTES:

1. LOCATE CONTROL JOINTS IN CMU PARTITIONS AS FOLLOWS: (UNLESS NOTED OTHERWISE BY STRUCTURAL ENGINEER)
   A. PARTITIONS EXCEEDING 25'-0".
   B. WHERE A PARTITION ABUTS A STRUCTURAL ELEMENT OR DISSIMILAR WALL.
   C. AT EXPANSION JOINTS
   D. REFER TO DETAILS FOR ADDITIONAL LOCATIONS

2. REFER TO WALL SECTIONS FOR THE USE OF STARTER COURSES AT THE BASE OF INTERIOR PARTITIONS.

3. PROVIDE CMU LINTELS FOR ALL OPENINGS IN INTERIOR CMU PARTITIONS. COORDINATE WITH STRUCTURAL.

4. PROVIDE A 3/4" SPACE BETWEEN TOP OF CMU AND STRUCTURE/DECK FOR POTENTIAL DEFLECTION. SEAL WITH APPROPRIATE CAULK.

GYPSUM WALLBOARD PARTITION NOTES:

1. ALL METAL STUDS PARTITIONS ARE 25 GAUGE METAL STUDS AT 16" O.C. UNLESS OTHERWISE NOTED. IF THE LIMITING HEIGHT FOR A PARTITION TYPE IS EXCEEDED, INCREASE SIZE AND/OR GAUGE OF METAL STUDS AS INDICATED ON "LIMITING HEIGHT OF METAL STUDS" TABLE. NOTIFY THE ARCHITECT PRIOR TO INSTALLATION.

2. WHEN CERAMIC TILE IS APPLIED TO GYP. BOARD PARTITIONS, PROVIDE 20 GAUGE METAL STUDS INSTEAD OF 25 GAUGE.

3. SET ALL FLOOR TRACKS ON A CONTINUOUS RIBBON OF SEALANT.

4. AT PARTITIONS DESIGNATED TO HAVE SOUND ATTENTUATION BLANKETS:
   A. PROVIDE 3-1/2" OR 6" THICK SOUND ATTENUATION BLANKETS OR BATTS FOR FULL HEIGHT OF PARTITION, UNLESS NOTED OTHERWISE.
   B. FILL ALL DECK VOIDS WITH SOUND ATTENUATION MATERIAL.
   C. SEAL PARTITION PERIMETER AND ALL PENETRATIONS WITH ACOUSTICAL SEALANT.
   D. TAPE & BED OR CAULK ALL JOINTS BETWEEN 1ST AND 2ND LAYERS OF SHEET ROCK AND AT ALL SOUND RATED WALLS TAKEN THROUGH THE CEILING.
   E. PROVIDE CONTINUOUS ACOUSTICAL SEALANT AT BOTTOM OF PARTITION ON BOTH SIDES AT NON-RATED PARTITIONS AND PROVIDE CONTINUOUS FIRE RATED SEALANT AT FIRE-RATED PARTITIONS.

5. DAMP LOCATIONS AT GYP. BOARD PARTITIONS:
   A. PROVIDE TILE BACKER BOARD ON WALLS BEHIND AND ADJACENT TO PLUMBING FIXTURES, AND BEHIND ALL CERAMIC TILE.

6. RIGIDLY BRACE ALL DOOR JAMBS, AT THE HINGE & STRIKE SIDES.

7. LOCATE CONTROL JOINTS IN GYP. BOARD PARTITIONS AS FOLLOWS:
   A. PARTITIONS OR FURRING RUNS EXCEEDING 30'-0"
   B. WHERE A PARTITION ABUTS A STRUCTURAL ELEMENT OR DISSIMILAR WALL.
   C. CONSTRUCTION CHANGES WITHIN PLANE OF PARTITION.
   D. AT EXPANSION OR CONTROL JOINTS THAT OCCUR THROUGHOUT THE BUILDING ITSELF.
   E. AT BOTH JAMBS OF INTERIOR AND EXTERIOR DOOR AND WINDOW FRAMES.

8. FIRE RATED PARTITIONS
   A. PROVIDE TYPE "X" FIRE RESISTIVE GYPSUM BOARD, 5/8" THICK UNLESS NOTED OTHERWISE.
   B. FILL ALL VOIDS AT DECK WITH FOAM FIRESTOP SEALANT.
   C. SEAL PARTITION PERIMETER AND ALL PENETRATIONS WITH RATED SEALANT.
   D. REFER TO UL RATED PARTITION DESCRIPTIONS FOR DETAILED CONSTRUCTION NOTES.

9. PROVIDE DEFLECTION TRACK AT STUD CONNECTION AT BOTTOM OF DECK AND FILL VOIDS AS REQ.

LIMITING HEIGHT OF METAL STUDS			
STUD SIZE	SPACING	25 GA.	20 GA.
2-1/2"	16"	11'-3"	12'-10"
3-5/8"	16"	14'-4"	16'-5"
6"	16"	19'-9"	24'-6"

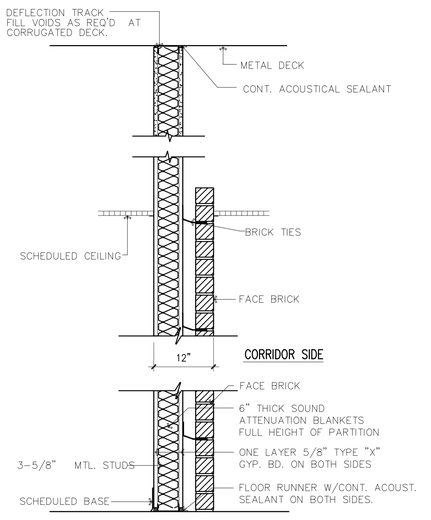
NOTE: THE TABLE INDICATED ABOVE IS BASED ON "DIETRICH" LIMITING HEIGHT CHART AND IS TO BE USED AS A GUIDE FOR INTERIOR WALL CONSTRUCTION. TABLE IS BASED WITH SHEATHING BOARD ON BOTH SIDES.

HOW TO USE THIS SHEET:

1. NOT EVERY PARTITION TYPE SHOWN IS NECESSARILY INTENDED FOR THE USE ON THIS PROJECT. REFER TO FLOOR PLANS FOR REFERENCE MARKS INDICATING APPLICABLE PARTITION TYPES.

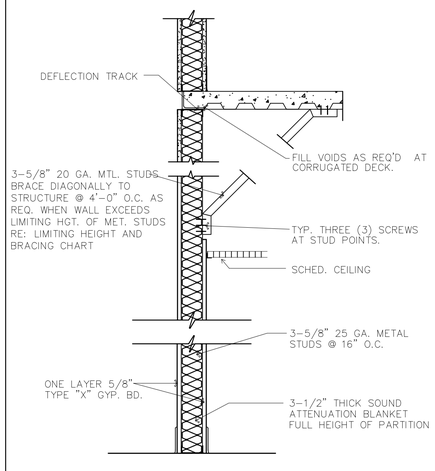
2. REFER TO BRACING DETAILS FOR SUPPORT OF THE TOP OF EACH PARTITION TYPE AND BRACING OF PARTITIONS THAT EXCEED LIMITING HEIGHT OF PARTITION TYPES.

8 GENERAL NOTES



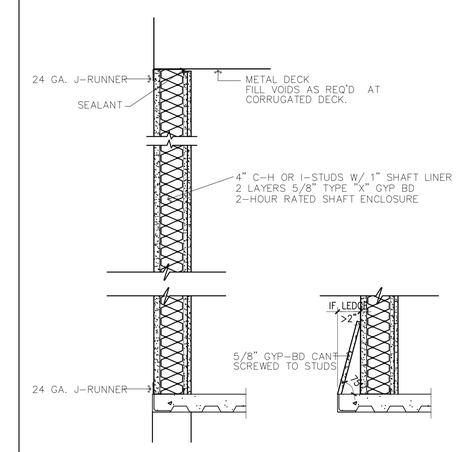
TYPE	FIRE RAT'G	DESCRIPTION
S12	ONE HR.	3-5/8" MTL. STUD TO DECK WITH FIRE RATED CEILING

5 PARTITION TYPE "S12"



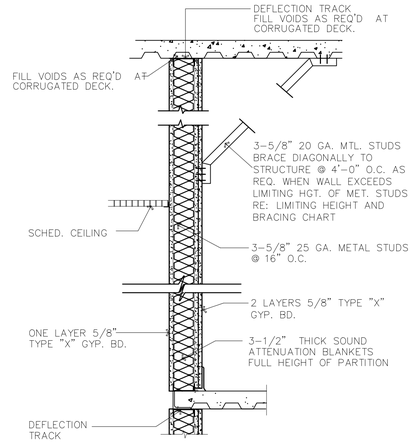
TYPE	FIRE RAT'G	DESCRIPTION
S11		W/ 3-1/2" SOUND ATTENUATION INSULATION

4 PARTITION TYPE "S11"



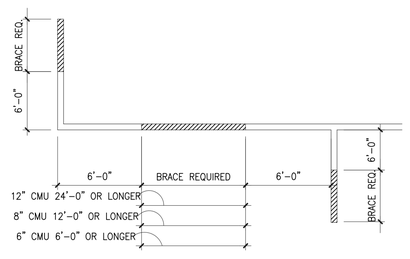
TYPE	FIRE RAT'G	DESCRIPTION
S10	2 HR.	ELEVATOR SHAFT WALL

3 PARTITION TYPE "S10"



TYPE	FIRE RAT'G	DESCRIPTION
S9	1 HR.	WITH 3-1/2" SOUND ATTENUATION BLANKETS WITH FIRE RATED CEILING

2 PARTITION TYPE "S9"



INTERIOR LOCATIONS ONLY

1. NON-LOAD BEARING WALL BRACES. BRACING AT THE TOP OF MASONRY WALLS IS REQUIRED ON STRAIGHT RUNS OF WALL MORE THAN SIX FEET FROM A CORNER OR INTERSECTING WALL.

1 TYP. CMU WALL BRACING

100% CD's - FOR CONSTRUCTION

REVISIONS

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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
.
MERCEDES, TEXAS

REGISTERED ARCHITECT JOSE ALVARADO 18005 STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE:
TYPICAL PARTITION TYPES

FILE NAME:

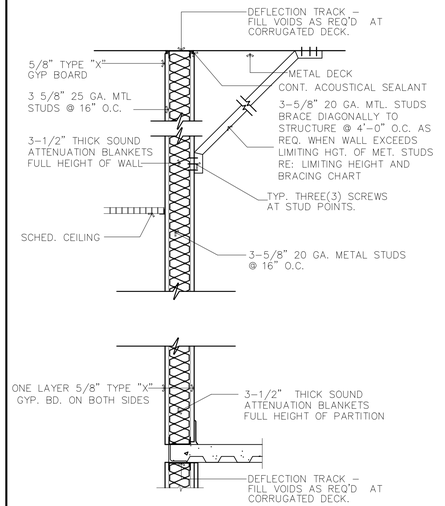
JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

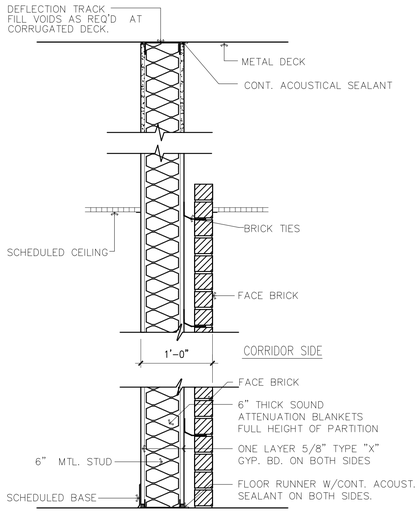
CHECKED BY: E.A. II/ E.A. III

SHEET: A7.04



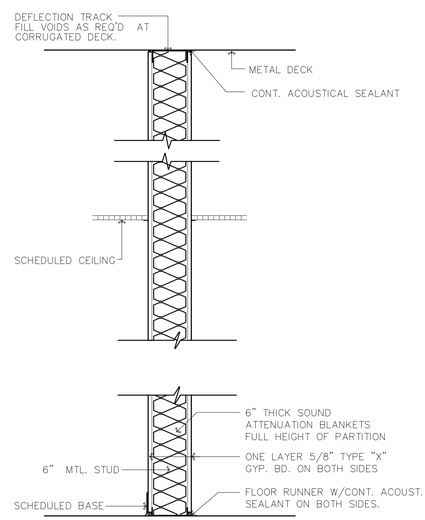
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S8	1 HR.	WITH 3-1/2" SOUND ATTENUATION BLANKETS WITH FIRE RATED CEILING

15 PARTITION TYPE "S8"



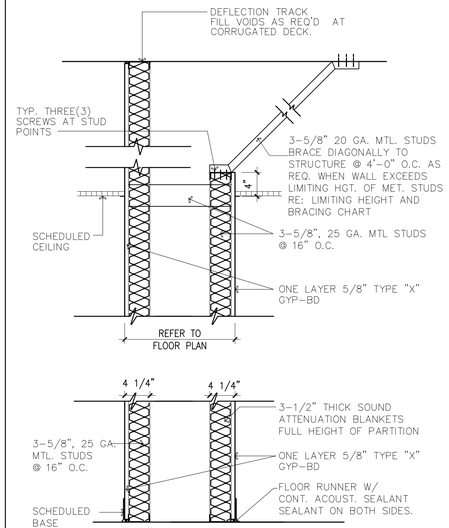
TYPE	FIRE RAT'G	DESCRIPTION
S7	ONE HR.	6" MTL. STUD TO DECK WITH FIRE RATED CEILING

14 PARTITION TYPE "S7"



TYPE	FIRE RAT'G	DESCRIPTION
S6	NONE	6" MTL. STUD TO DECK
S6A	ONE HR.	6" MTL. STUD TO DECK WITH FIRE RATED CEILING

13 PARTITION TYPE "S6"



TYPE	FIRE RAT'G	DESCRIPTION
S5	NONE	3-5/8" MTL. STUD TO DECK ONE SIDE

12 PARTITION TYPE "S5"

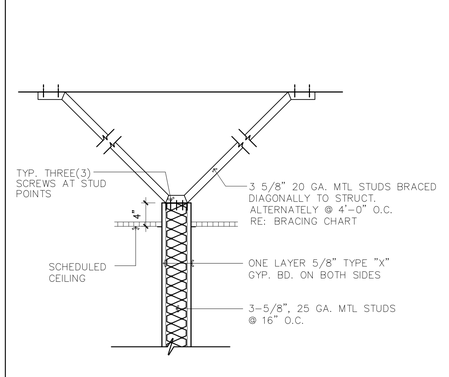
BRACE FRAMING FOR 3 5/8" STUDS

STUD TYPE	STUD PROPERTIES	SPACING	MAX. LENGTH	MISCELLANEOUS
SJ 20 (40 KSI) (20 GA)	1x = 0.541 IN^4	4'-0" O.C.	14'-0"	BRACE @ MID-POINT FOR LENGTHS OVER 14'-0"
	rx = 1.429 IN			
	A = 0.2136 IN 2			
	Sx = 0.273 IN 3			

BRACE FRAMING FOR 6" STUDS

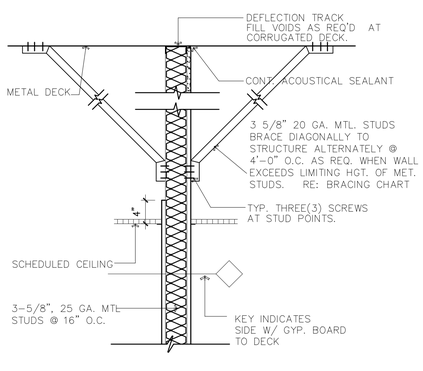
STUD TYPE	STUD PROPERTIES	SPACING	MAX. LENGTH	MISCELLANEOUS
SJ 20 (40 KSI) (20 GA)	1x = 1.787 IN^4	4'-0" O.C.	20'-0"	BRACE @ MID-POINT FOR LENGTHS OVER 20'-0"
	rx = 2.253 IN			
	A = 0.2148 IN 2			
	Sx = 0.539 IN 3			

11 BRACING CHART



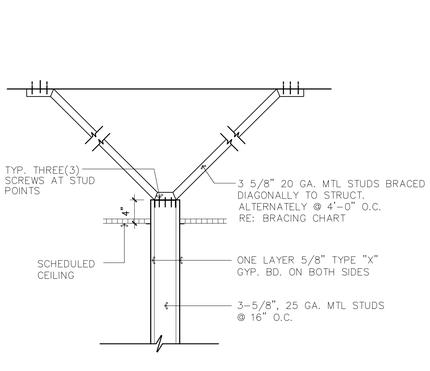
TYPE	FIRE RAT'G	DESCRIPTION
S4	ONE HOUR	3-5/8" MTL. STUD TO DECK WITH FIRE RATED CEILING

5 PARTITION TYPE "S4"



TYPE	FIRE RAT'G	DESCRIPTION
S3	NONE	3-5/8" MTL. STUD TO DECK,
S3A	ONE HOUR	3-5/8" MTL. STUD TO DECK WITH FIRE RATED CEILING

4 PARTITION TYPE "S3"

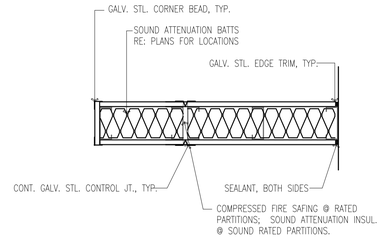


TYPE	FIRE RAT'G	DESCRIPTION
S2	NONE	3-5/8" METAL STUDS
S2A	ONE HOUR	NO INSULATION WITH FIRE RATED CEILING

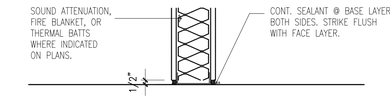
3 PARTITION TYPE "S2"

TYPE	FIRE RAT'G	DESCRIPTION
S1	NONE	W/ 3 1/2" SOUND ATTENUATION INSULATION
S1A	ONE HOUR	W/ 3 1/2" SOUND ATTENUATION INSULATION WITH FIRE RATED CEILING

2 PARTITION TYPE "S1"



PLAN (TERMINATIONS & JOINTS)



BASE

1 TYPICAL DETAILS

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REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT ... DATE: 11/06/20

DRAWING TITLE: TYPICAL PARTITION TYPES

FILE NAME:

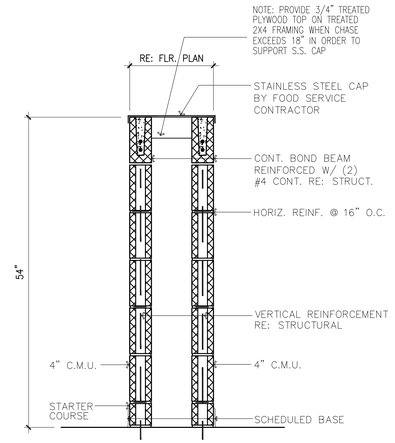
JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

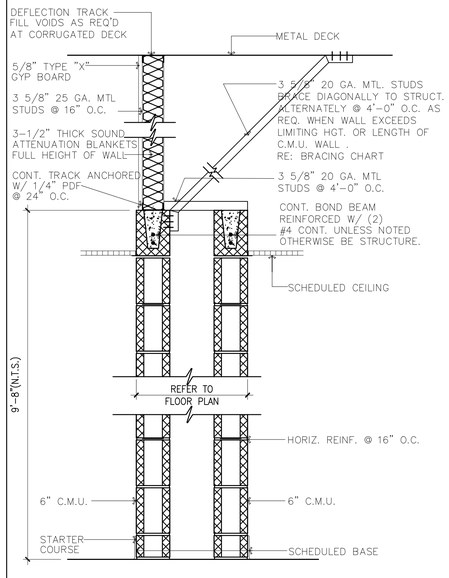
CHECKED BY: E.A. II/ E.A. III

SHEET: A7.05



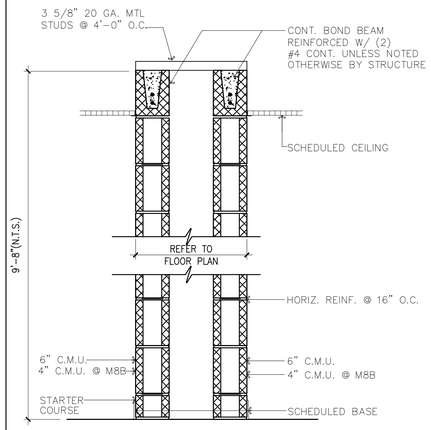
TYPE	FIRE RAT'G	DESCRIPTION
M10	NONE	DOUBLE WYTHE 4" CMU – 54" HIGH

15 PARTITION TYPE "M10"



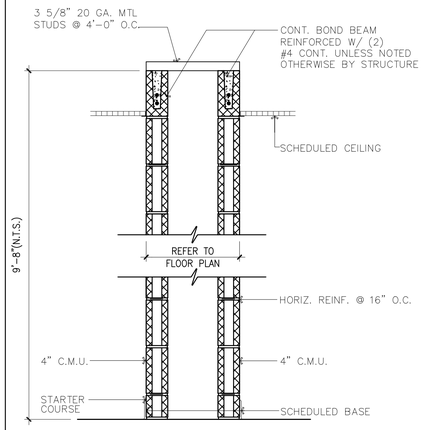
TYPE	FIRE RAT'G	DESCRIPTION
M9	NONE	DOUBLE WYTHE 6" CMU

14 PARTITION TYPE "M9"



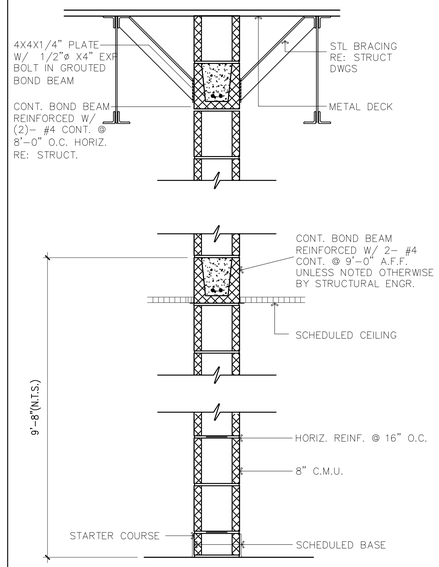
TYPE	FIRE RAT'G	DESCRIPTION
M8	NONE	DOUBLE WYTHE 6" CMU
M8B	NONE	DOUBLE WYTHE 4" CMU

13 PARTITION TYPE "M8"



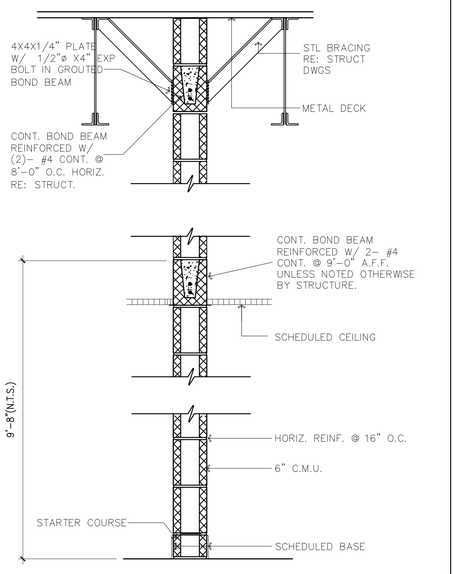
TYPE	FIRE RAT'G	DESCRIPTION
M7	NONE	DOUBLE WYTHE 4" CMU

12 PARTITION TYPE "M7"



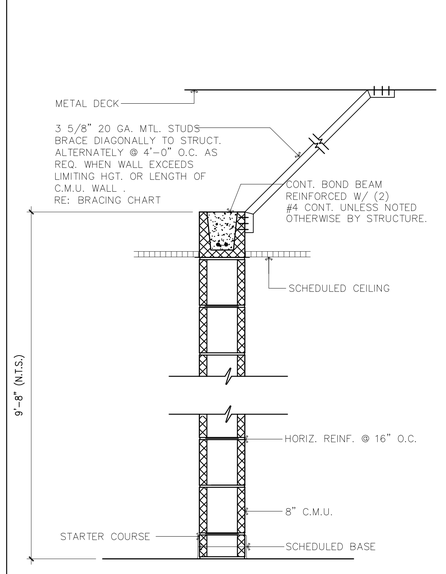
TYPE	FIRE RAT'G	DESCRIPTION
M6	NONE	8" CMU, TO DECK
M6A	ONE HOUR	8" CMU, TO DECK WITH FIRE RATED CEILING
M6B	TWO HOUR	8" CMU, TO DECK WITH FIRE RATED CEILING

11 PARTITION TYPE "M6"



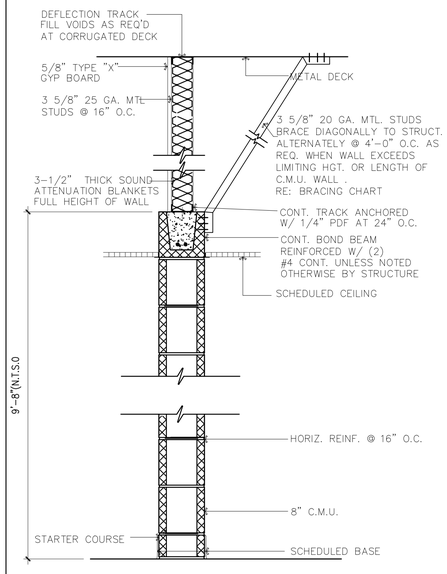
TYPE	FIRE RAT'G	DESCRIPTION
M5	NONE	6" CMU TO DECK
M5A	ONE HOUR	6" CMU TO DECK WITH FIRE RATED CEILING
M5B	TWO HOUR	6" CMU TO DECK WITH FIRE RATED CEILING

5 PARTITION TYPE "M5"



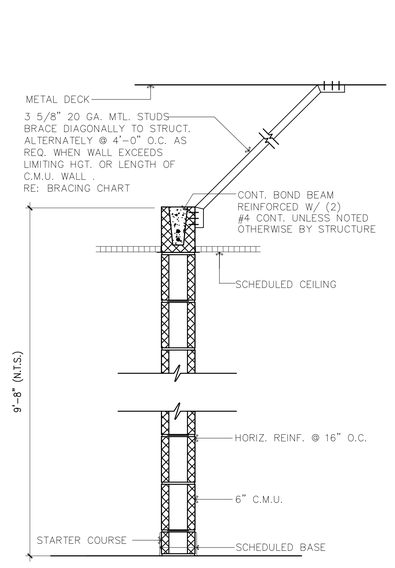
TYPE	FIRE RAT'G	DESCRIPTION
M4	NONE	8" CMU
M4A	ONE HOUR	8" CMU WITH FIRE RATED CEILING

4 PARTITION TYPE "M4"



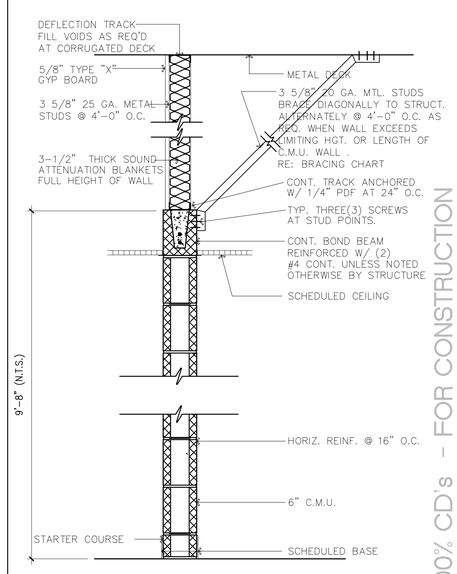
TYPE	FIRE RAT'G	DESCRIPTION
M3	NONE	8" CMU
M3A	ONE HOUR	8" CMU WITH FIRE RATED CEILING

3 PARTITION TYPE "M3"



TYPE	FIRE RAT'G	DESCRIPTION
M2	NONE	6" CMU
M2A	ONE HOUR	6" CMU WITH FIRE RATED CEILING

2 PARTITION TYPE "M2"



TYPE	FIRE RAT'G	DESCRIPTION
M1	NONE	6" CMU
M1A	ONE HOUR	6" CMU WITH FIRE RATED CEILING

1 PARTITION TYPE "M1"

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REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
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TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1477

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT JOSEPH ALVARADO 19139 STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE:
TYPICAL PARTITION TYPES

FILE NAME:

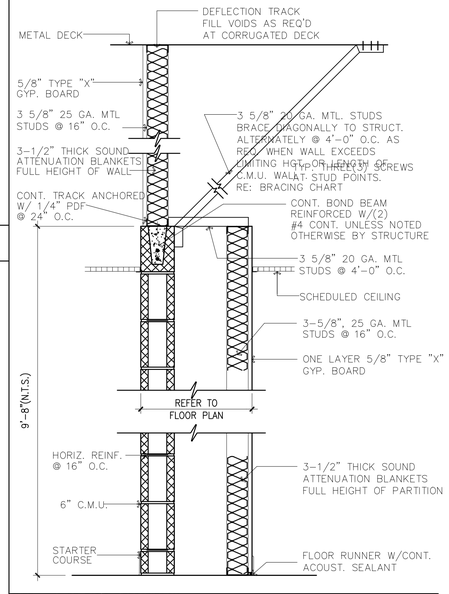
JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

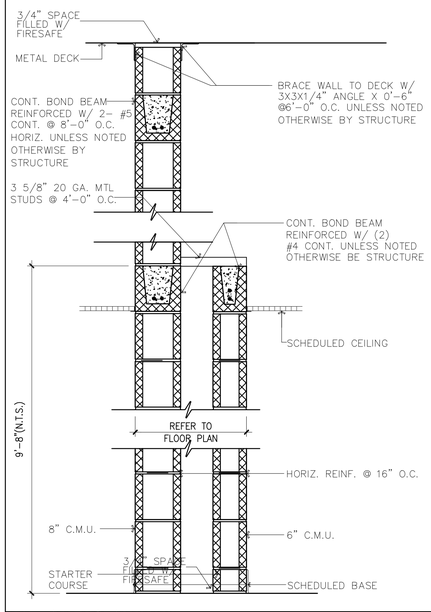
CHECKED BY: E.A. II/ E.A. III

SHEET: A7.06



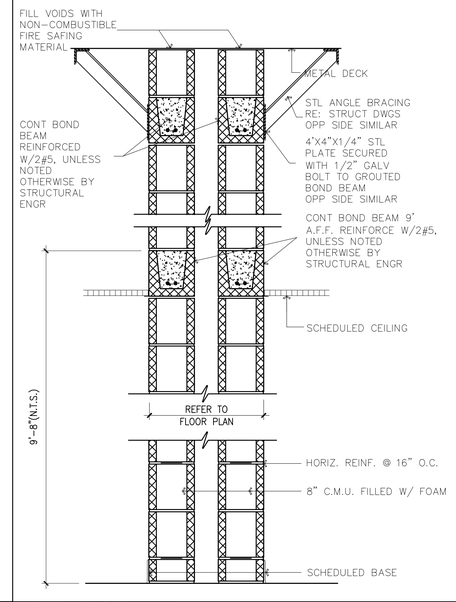
TYPE	FIRE RAT'G	DESCRIPTION
M18	ONE HOUR	DOUBLE WYTHE 6" CMU AND METAL STUD WITH FIRE RATED CEILING

11 PARTITION TYPE "M18"



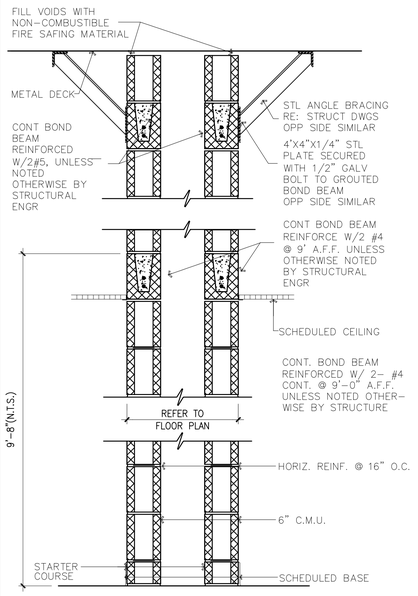
TYPE	FIRE RAT'G	DESCRIPTION
M17	TWO HOUR	DOUBLE WYTHE 8" CMU AND 6" CMU WITH FIRE RATED CEILING

11 PARTITION TYPE "M17"



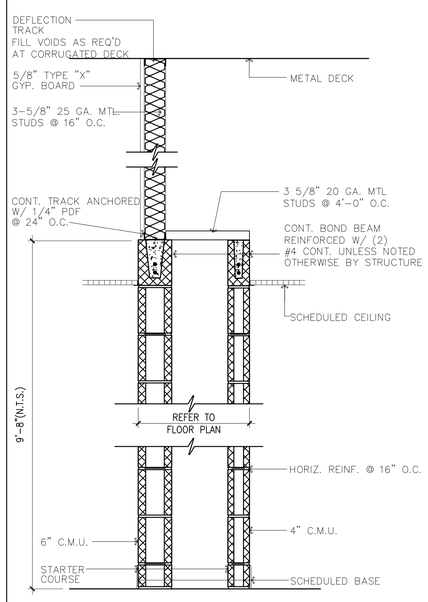
TYPE	FIRE RAT'G	DESCRIPTION
M16	NONE	TWO WYTHES FOAM FILLED 8" CMU W/ 4" AIR SPACE BETWEEN TO DECK

11 PARTITION TYPE "M16"



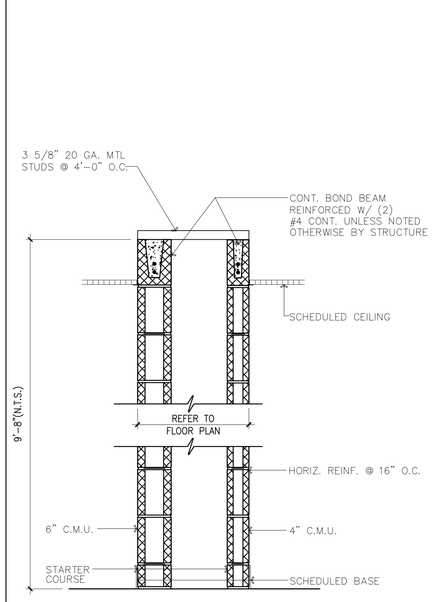
TYPE	FIRE RAT'G	DESCRIPTION
M15	NONE	DOUBLE WYTHE 6" CMU WITH FOAM FILL, SEALED TO DECK
M15A	ONE HOUR	DOUBLE WYTHE 6" CMU WITH FOAM FILL, SEALED TO DECK W/ FIRE RATED CLG.
M15A	TWO HOUR	DOUBLE WYTHE 6" CMU WITH FOAM FILL, SEALED TO DECK W/ FIRE RATED CLG.

5 PARTITION TYPE "M15"



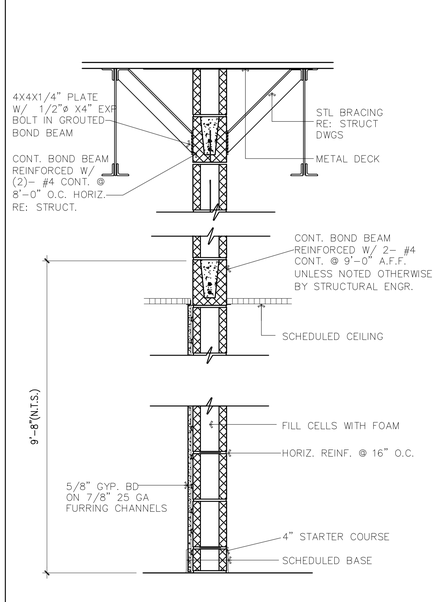
TYPE	FIRE RAT'G	DESCRIPTION
M14	NONE	DOUBLE WYTHE 6" AND 4" CMU
M14A	ONE HOUR	DOUBLE WYTHE 6" AND 4" CMU WITH FIRE RATED CEILING

4 PARTITION TYPE "M14"



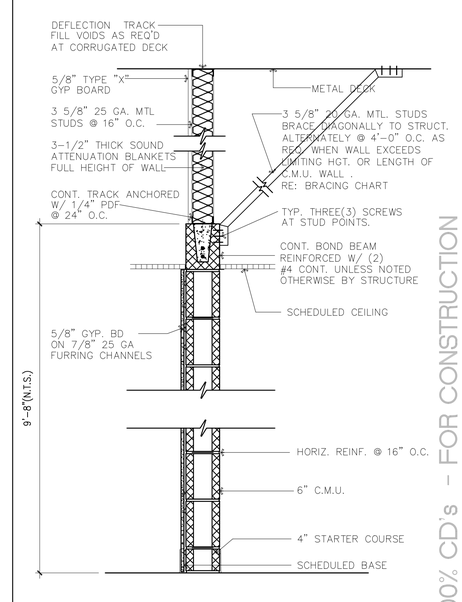
TYPE	FIRE RAT'G	DESCRIPTION
M13	NONE	DOUBLE WYTHE 6" AND 4" CMU
M13A	ONE HOUR	DOUBLE WYTHE 6" AND 4" CMU WITH FIRE RATED CEILING

3 PARTITION TYPE "M13"



TYPE	FIRE RAT'G	DESCRIPTION
M12	ONE HOUR	6" CMU TO DECK WITH W/5/8" GYP ONE SIDE WITH FIRE RATED CEILING

2 PARTITION TYPE "M12"



TYPE	FIRE RAT'G	DESCRIPTION
M11	ONE HOUR	6" CMU TO DECK WITH W/5/8" GYP ONE SIDE WITH FIRE RATED CEILING

1 PARTITION TYPE "M11"

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REVISIONS

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ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT
JOSEPH ALVARADO
STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE:
TYPICAL
PARTITION TYPES

FILE NAME:

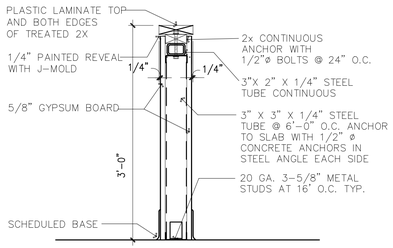
JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

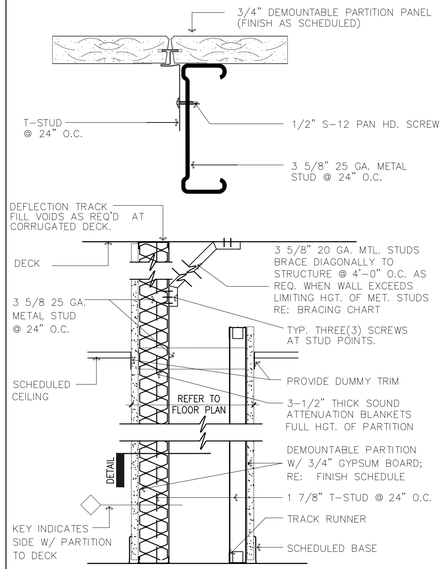
CHECKED BY: E.A. II/ E.A. III

SHEET: A7.07



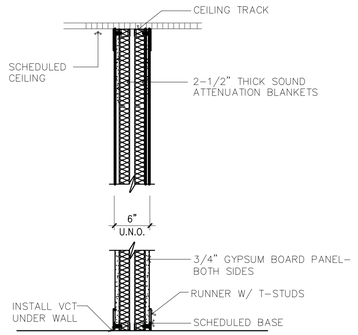
TYPE	FIRE RAT'G	DESCRIPTION
S6	NONE	3 5/8" MTL. STUD HALF WALL W/PLAM CAP

4 PARTITION TYPE "S16"



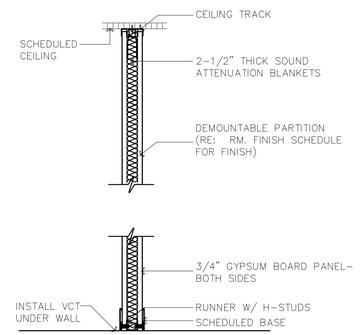
TYPE	FIRE RAT'G	DESCRIPTION
S15		DEMOUNTABLE PARTITION CHASE WALL

3 PARTITION TYPE "S15"



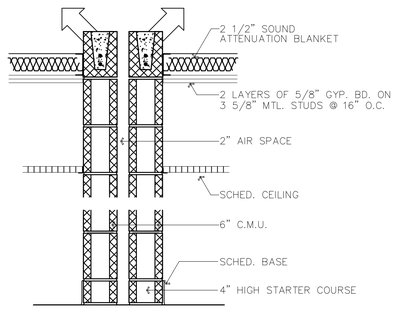
TYPE	FIRE RAT'G	DESCRIPTION
S14		WITH SOUND ATTENUATION BLANKETS
S14A		WITHOUT SOUND ATTENUATION BLANKETS

2 PARTITION TYPE "S14"



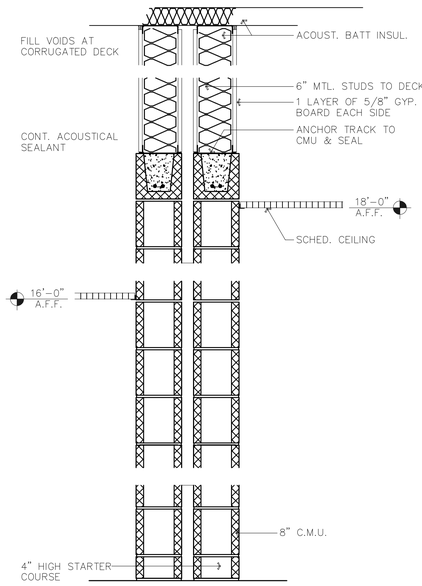
TYPE	FIRE RAT'G	DESCRIPTION
S13	NONE	WITH SOUND ATTENUATION BLANKETS
S13A	ONE HOUR	WITH SOUND ATTENUATION BLANKETS WITH FIRE RATED CEILING
S13B	NONE	WITHOUT SOUND ATTENUATION BLANKETS

1 PARTITION TYPE "S13"



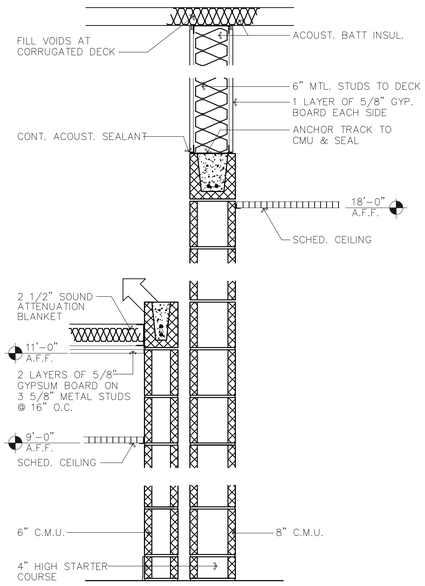
TYPE	FIRE RATING	STC	DESCRIPTION
M13	–	–	

5 PARTITION TYPE "M13"



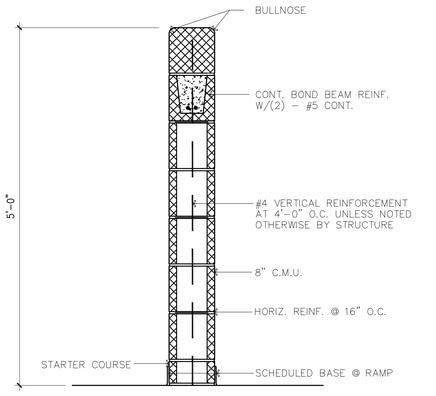
TYPE	FIRE RATING	STC	DESCRIPTION
M20	–	–	8" CMU

4 PARTITION TYPE "M20"



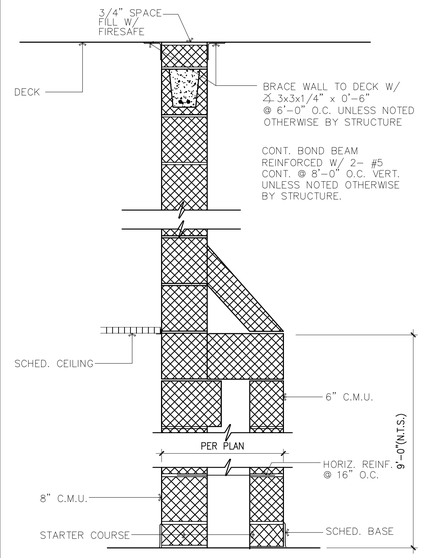
TYPE	FIRE RATING	STC	DESCRIPTION
M19	–	–	8" CMU

3 PARTITION TYPE "M19"



TYPE	FIRE RAT'G	DESCRIPTION
M20	NONE	8" CMU HALF WALL TO 5'-0" A.F.F.

2 PARTITION TYPE "M20"



TYPE	FIRE RAT'G	DESCRIPTION
M19	NONE	8" C.M.U. -TO DECK & 6" C.M.U.
M19A	ONE HOUR	8" C.M.U. -TO DECK & 6" C.M.U. WITH FIRE RATED CEILING

1 PARTITION TYPE "M19"

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REVISIONS

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT JOSEPH M. ALVARADO JR. 19739 STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE:
TYPICAL PARTITION TYPES

FILE NAME:

JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: A7.08

20 NOT USED
Scale: N.T.S.

19 NOT USED
Scale: N.T.S.

18 NOT USED
Scale: N.T.S.

17 NOT USED
Scale: N.T.S.

16 NOT USED
Scale: N.T.S.

15 NOT USED
Scale: N.T.S.

14 NOT USED
Scale: N.T.S.

13 NOT USED
Scale: N.T.S.

12 NOT USED
Scale: N.T.S.

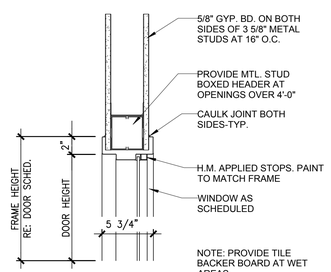
11 NOT USED
Scale: N.T.S.

10 NOT USED
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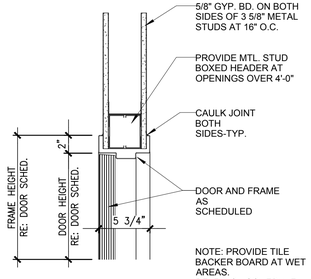
9 NOT USED
Scale: N.T.S.

8 NOT USED
Scale: N.T.S.

7 H.M. WIN. HEAD - 3 5/8" STUD
Scale: 3" = 1'-0"



6 H.M. DOOR HEAD - 3 5/8" STUD
Scale: 3" = 1'-0"

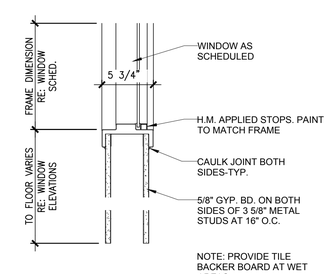


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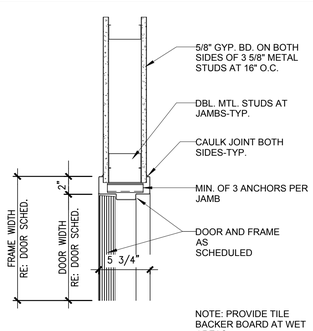
4 NOT USED
Scale: N.T.S.

3 NOT USED
Scale: N.T.S.

2 H.M. WIN. SILL - 3 5/8" STUD
Scale: 3" = 1'-0"



1 H.M. DOOR JAMB - 3 5/8" STUD
Scale: 3" = 1'-0"



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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT OREN W. ALVARADO III 18450 STATE OF TEXAS
DATE: 11/06/20

DRAWING TITLE:
DOOR/WINDOW HEAD AND JAMB DETAILS

FILE NAME:

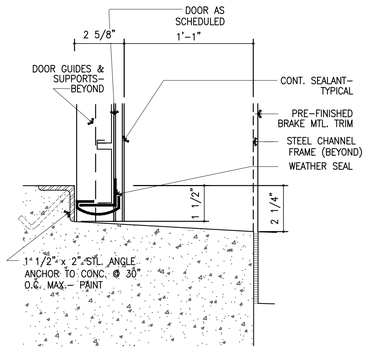
JOB NO.: 1718

DATE: 11/06/2020

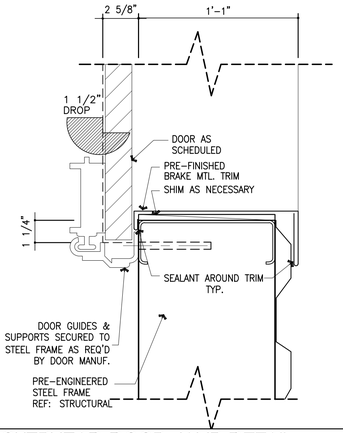
DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

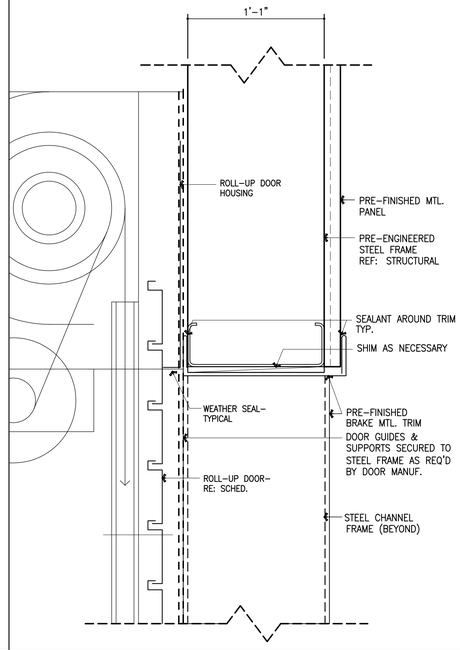
SHEET: A9.00



15 OVERHEAD DOOR SILL DETAIL
Scale: 3" = 1'-0"

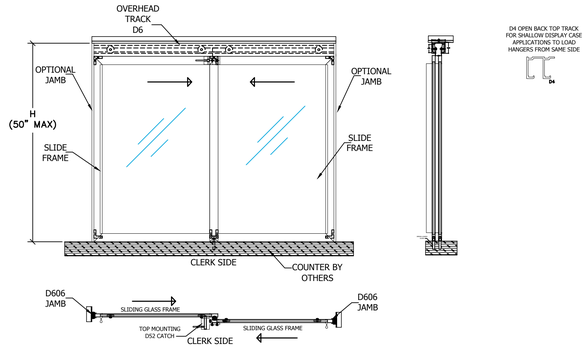


14 OVERHEAD DOOR JAMB DETAIL
Scale: 3" = 1'-0"

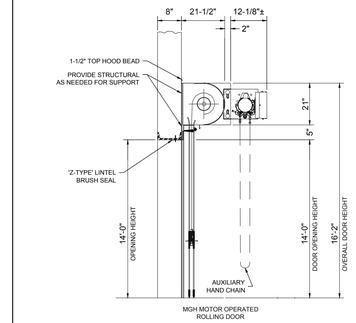


13 OVERHEAD DOOR HEAD DETAIL
Scale: 3" = 1'-0"

12 NOT USED
Scale: N.T.S.

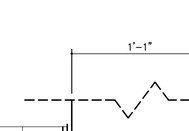


17 BYPASS SLIDER WINDOW DETAIL
SCALE: N.T.S.



11 OVERHEAD DOOR SECT. DETAIL
Scale: N.T.S.

10 DETAILS
Scale: N.T.S.



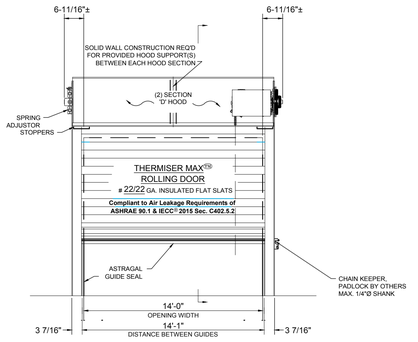
BOTTOM BAR / SLAT DETAIL



PLAN OF OPENING

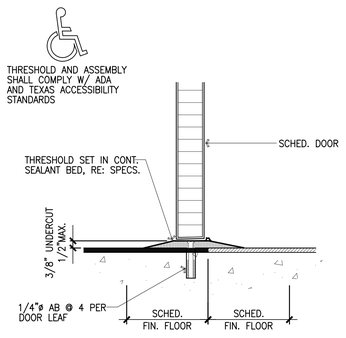
ENDLOCK DETAIL

8 DETAILS
Scale: N.T.S.

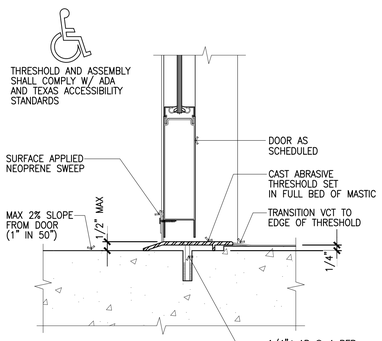


6 OVERHEAD DOOR INTERIOR ELEVATION
Scale: N.T.S.

5 NOT USED
Scale: N.T.S.

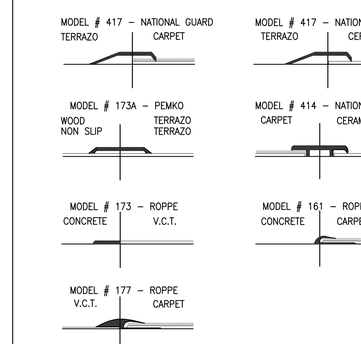


4 INT. DOOR THRESHOLD, TYP.
Scale: 3" = 1'-0"



3 EXT. DOOR THRESHOLD, TYP.
Scale: 3" = 1'-0"

2 NOT USED
Scale: N.T.S.



1 INT. TRANSITION @ FLOOR
Scale: N.T.S.

ALVARADO ARCHITECTS & ASSOCIATES, INC.
ARCHITECTS, PLANNERS, CONSTRUCTION MANAGEMENT, INTERIORS
307 SOUTH MAIN ST. DONNA, TEXAS 78537
TEL. (956) 464-8258 FAX. (956) 464-8259

1902 JOE STEPHENS AVE.
STE. 101
WESLACO, TX 78596
TEL: (956) 968-8733
FAX: (956) 969-1417

REVISIONS

HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

DATE: 11/06/20

100% CD's - FOR CONSTRUCTION

DRAWING TITLE:
DOOR/WINDOW HEAD AND JAMB DETAILS

FILE NAME:

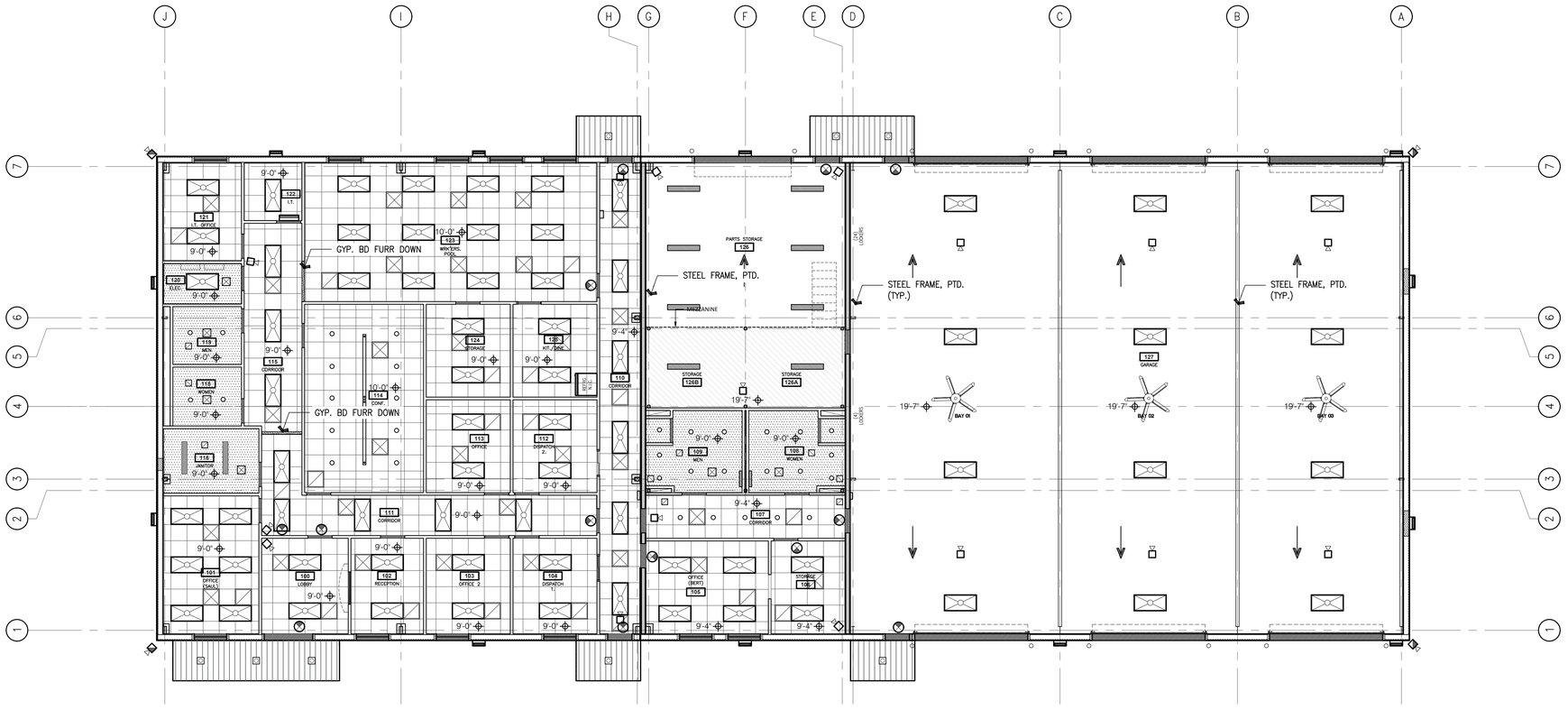
JOB NO.: 1718

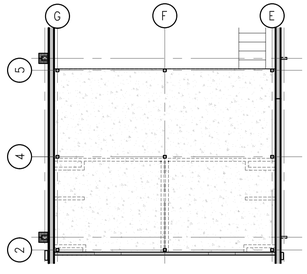
DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: A9.01





GENERAL RCP NOTES

1. ALL CEILING AND SOFFIT HEIGHTS ARE GIVEN ABOVE FINISHED FLOOR ELEVATION (EL. 0'-0").
2. GENERALLY ONLY CEILING MOUNTED FIXTURES ARE SHOWN ON THIS PLAN. COORDINATE WITH MEP PLANS FOR ADDITIONAL INFORMATION.
3. SOME OR ALL SPRINKLERS MAY NOT BE SHOWN ON THIS PLAN. COORDINATE WITH MEP DRAWINGS FOR ADDITIONAL INFORMATION. SPRINKLER HEADS TO BE CENTERED ON CEILING TILE, TYP.
4. VERIFY LOCATIONS OF ALL CEILING ACCESS PANELS WITH MEP DRAWINGS. COORDINATE LOCATIONS OF PANELS WITH ARCHITECT PRIOR TO INSTALLATION. ACCESS PANEL FIRE RATINGS MUST MATCH CEILING ASSEMBLY FIRE RATINGS.
5. LIGHTING FIXTURES TO BE CENTERED AND SPACED EQUALLY UNLESS NOTED OTHERWISE.
6. LIGHT FIXTURES ARE SHOWN FOR DIMENSIONAL PURPOSES ONLY COORDINATE WITH ELECTRICAL DRAWINGS FOR FIXTURE DESIGNATIONS.
7. IF PROJECT INCLUDES FIRE RATED CEILINGS, LIGHT FIXTURES LOCATED IN RATED CEILING ASSEMBLIES ARE TO BE TENTED OR OTHERWISE RATED TO MATCH THE CEILING.

LIGHTING FIXTURE LEGEND

- 2X4 LED LAY-IN FIXTURE
- 2X2 LED LAY-IN FIXTURE
- LINEAR PENDANT FIXTURE — RE: PLAN
- LINEAR STRIP FIXTURE — RE: PLAN
- RECESSED DOWN LIGHT
- CEILING FAN
- WALL MOUNTED SCONCE
- WALL PACK FIXTURE
- EXIT LIGHT
- MINI-SPLIT UNIT
- WALL MOUNTED FAN/EXHAUST

CEILING LEGEND

- ACT1 — (08.01.00) 2'-0" x 2'-0" ACOUSTICAL SAG AND HUMIDITY RESISTANT LAY-IN CEILING (ACT-1)
- ACT2 — (08.01.00) 2'-0" x 2'-0" ACOUSTICAL LAY-IN CEILING (ACT-2)
- PLASTER — (09.24.00) LATH AND PLASTER; PAINTED
- METAL — (09.54.00) METAL SOFFIT; PRE-FINISHED
- EXPOSED — EXPOSED STRUCTURE; PAINTED
- GYP. BD.1 — (09.21.16) GYPSUM BOARD; PAINTED
- GYP. BD.2 — (09.21.16) MOISTURE RESISTANT GYPSUM BOARD; PAINTED
- CEILING SLOPES

SECURITY DEVICES

- EXTERIOR WALL MOUNTED CAMERA
- INTERIOR WALL MOUNTED CAMERA
- 360° VIEW CEILING MOUNTED CAMERA

NOTE: REFERENCE MEP DRAWINGS

0 4' 8' 16' 24'
SCALE: 1/8" = 1'-0"

N — PLAN NORTH
N — TRUE NORTH

5 REFLECTED CEILING PLAN
Scale: 1/8" = 1'-0"

100% CD's - FOR CONSTRUCTION

REVISIONS

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TEL. (956) 464-8258 FAX. (956) 464-8259

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HIDALGO COUNTY, PCT.1
SUNSET PARK OPERATIONS FACILITY
MERCEDES, TEXAS

REGISTERED ARCHITECT — STATE OF TEXAS — 11718

DATE: 11/06/2020

DRAWING TITLE: REFLECTED CEILING PLAN

FILE NAME:

JOB NO.: 1718

DATE: 11/06/2020

DRAWN BY: MG

CHECKED BY: E.A. II/ E.A. III

SHEET: A10.00

MECHANICAL GENERAL LEGEND

DUCTWORK SYMBOLS

DESCRIPTION	SINGLE LINE	DOUBLE LINE
ACCESS DOOR	AD	AD
BACKDRAFT DAMPER	BDD	BDD
FIRE DAMPER	F	F
FLEXIBLE CONNECTION	FC	FC
MOTORIZED DAMPER	M	M
CONTROL DAMPER	CD M	CD M
VOLUME DAMPER, MANUAL	VD	VD
DUCT ELBOW WITH TURNING VANES		
DUCT SECTION – SUPPLY AIR		
DUCT SECTION – EXHAUST AIR		
DUCT SECTION – RETURN, OUTSIDE, OR RELIEF AIR		
DUCT, INCLINED DROP		
DUCT, INCLINED RISE		
FLEXIBLE DUCT – ROUND	8"ø	8"ø
DUCT TRANSITION	14/10 — 10/10	14/10
DUCT TRANSITION (SQUARE OR RECTANGULAR TO ROUND)	10/10 — 8"ø	12/12 — 8"ø
RECTANGULAR DUCT, SIZE IN INCHES, FIRST DIMENSION IS SIDE SHOWN (NET CLEAR INSIDE DIMENSION)	10/14	10/14
ROUND DUCT, DIAMETER IN INCHES (NET CLEAR INSIDE DIMENSION)	8"ø	8"ø
AIR FLOW IN DIRECTION OF ARROW		
45° BRANCH TAKE–OFFS		
CONICAL LATERAL BRANCH TAKE–OFFS		
CEILING SUPPLY DIFFUSERS		
CEILING RETURN GRILLE/REGISTER		
CEILING EXHAUST FAN (EF–X)		EF–X
CEILING EXHAUST GRILLE/REGISTER		
SIDEWALL SUPPLY GRILLE/REGISTER		
SIDEWALL RETURN/EXHAUST GRILLE/REGISTER		
EXTRACTOR		
DUCT TEE WITH SPLITTER DAMPER		
DOOR UNDERCUT	—UC—	—UC—
DOOR LOUVER	—L—	—L—

MISCELLANEOUS SYMBOLS

- (P) DUCT STATIC PRESSURE SENSOR
- SD DUCT SMOKE DETECTOR
- CO CARBON MONOXIDE SENSOR
- NEW CONNECTION TO EXISTING
- (H) HUMIDISTAT
- RH RELATIVE HUMIDITY SENSOR
- (T) COMBINED TEMPERATURE AND HUMIDITY SENSOR 7–DAY PROGRAMMABLE CONTROLLER (MOUNT 48" AFF)
- T DUCT TEMPERATURE SENSOR
- TC TIME CLOCK
- F FREEZESTAT
- DIFFUSER, GRILLE OR REGISTER MARK.
- A – 500 / 24 24 — AIR FLOW (CFM) / RECTANGULAR FACE SIZE (WHERE APPLICABLE)
- 01 / M1.01 — DIRECTION OF SECTION; IDENTIFYING NUMBER OR LETTER FOR SECTIONS; NUMBER OF REFERENCE DRAWING WHERE SECTION IS SHOWN.
- 01 / M1.01 — IDENTIFYING NUMBER OR LETTER FOR DETAILS; NUMBER OF REFERENCE DRAWING WHERE DETAIL IS SHOWN.
- ENLARGED DETAIL REFERENCE
- MATCHLINE
- LINE WITH HATCHING DESIGNATES DEMOLITION WORK

AIRFLOW DIAGRAM SYMBOLS

- C / C — COOLING COIL
- H / C — HEATING COIL
- LOUVER
- BDD — BACKDRAFT DAMPER
- FD/SD — FIRE/SMOKE DAMPER
- AFMS — AIR FLOW MEASURING STATION
- M — MOTORIZED OPPOSED BLADE DAMPER
- M — MOTORIZED PARALLEL BLADE DAMPER
- FAN STARTER
- FAN
- FAN WITH ADJUSTABLE FREQUENCY MOTOR CONTROLLER

GENERAL ABBREVIATIONS

A	
AAV	AUTOMATIC AIR VALVE
AFF	ABOVE FINISHED FLOOR
AFMS	AIR FLOW MEASURING STATION
AMB	AMBIENT
APD	AIR PRESSURE DROP
B	
BD	BLOWDOWN
BF	BLIND FLANGE
BFP	BACKFLOW PREVENTOR
BFV	BUTTERFLY VALVE
BHP	BRAKE HORSEPOWER
BLV	BALANCING VALVE
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BOS	BOTTOM OF STEEL
BV	BALL VALVE
C	
CAP	CAPACITY
CCMS	CENTRAL CONTROL MONITORING SYSTEM
CENT	CENTRIFUGAL
CMBST	COMBUSTION AIR
CL	CENTER LINE
CV	CONTROL VALVE OR CONSTANT VOLUME
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
D	
D	DIFFUSER OR DAMPER
DB	DRY BULB
DEG	DEGREES
DIA	DIAMETER
DN	DOWN
DX	DIRECT EXPANSION
E	
EAT	ENTERING AIR TEMPERATURE
EDB	ENTERING DRY BULB TEMPERATURE
EFF	EFFICIENCY
ENT	ENTERING
ESP	EXTERNAL STATIC PRESSURE
EWB	ENTERING WET BULB
EWT	ENTERING WATER TEMPERATURE
F	
FCV	FLOW CONTROL VALVE
FLA	FULL LOAD AMP
FLEX	FLEXIBLE
FM	FLOW METER
FWL	FIXED WALL LOUVER
G	
GR	GRILLE
GV	GATE VALVE
H	
HZ	CYCLES PER SECOND (HERTZ)
K	
kW	KILOWATT
L	
LAT	LEAVING AIR TEMPERATURE
LDB	LEAVING DRY BULB TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
M	
MAX	MAXIMUM
MFR	MANUFACTURER
MIN	MINIMUM
MVD	MOTORIZED VOLUME DAMPER
MW	MAKE UP WATER
N	
NC	NORMALLY CLOSED
NK	NECK
NO	NORMALLY OPEN OR NUMBER
NTS	NOT TO SCALE
O	
OA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
P	
PD	PRESSURE DROP
PH	PHASE
PI	PRESSURE INDICATOR
PRV	PRESSURE RELIEF VALVE
PS	PRESSURE SENSOR
PSV	PRESSURE SAFETY VALVE
PTRV	PRESSURE TEMPERATURE RELIEF VALVE
PV	PLUG VALVE
PCW	PRIMARY CHILLED WATER
PCWS	PRIMARY CHILLED WATER SUPPLY
PCWR	PRIMARY CHILLED WATER RETURN
PCWP	PRIMARY CHILLED WATER PUMP
R	
RED	REDUCER
REG	REGISTER
RH	RELATIVE HUMIDITY
RPM	REVOLUTIONS PER MINUTE
S	
SA	SUPPLY AIR
SENS	SENSIBLE
SL	SOUND LINING
SD	SMOKE DETECTOR
SOV	SOLENOID OPERATED VALVE OR SHUT–OFF VALVE
SP	STATIC PRESSURE
SS	STAINLESS STEEL
SCW	SECONDARY CHILLED WATER
SCWS	SECONDARY CHILLED WATER SUPPLY
SCWR	SECONDARY CHILLED WATER RETURN
SCWP	SECONDARY CHILLED WATER PUMP
T	
TOD	TOP OF DUCT
TOP	TOP OF PIPE
TOS	TOP OF STEEL
TS	TEMPERATURE SENSOR
TSTAT	THERMOSTAT
TSP	TOTAL STATIC PRESSURE
U	
UNO	UNLESS NOTED OTHERWISE
V	
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
VTR	VENT THROUGH ROOF
W	
WB	WET BULB
WPD	WATER PRESSURE DROP
WTR	WATER
WxHxL	WIDTH BY HEIGHT BY LENGTH

EQUIPMENT ABBREVIATIONS

A	
AHU	AIR HANDLING UNIT
AC	AIR CURTAIN
ACU	AIR CONDENSING UNIT
ACCU	AIR COOLED CONDENSING UNIT
AS	AIR SEPARATOR
B	
B	BOILER
BAS	BUILDING AUTOMATION SYSTEM
BCU	BLOWER COIL UNIT
C	
CC	COOLING COIL
CF	CHEMICAL FEEDER
CH	CHILLER
CP	CONDENSER PUMP
CRAC	COMPUTER ROOM AIR CONDITIONER
CRCU	COMPUTER ROOM CONDENSING UNIT
CT	COOLING TOWER
CWP	CHILLED WATER PUMP
D	
DC	DUST COLLECTOR
E	
EDH	ELECTRIC DUCT HEATER
EF	EXHAUST FAN
EH	ELECTRIC HEATER
ET	EXPANSION TANK
F	
F	FILTER
FCU	FAN COIL UNIT
FCCU	FAN COIL CONDENSING UNIT
FPB	FAN POWER BOX
G	
GFUH	GAS FIRED UNIT HEATER
H	
HC	HOT WATER HEATING COIL
HWP	HOT WATER PUMP
L	
L	LOUVER
O	
OAH	OUTSIDE AIR HOOD
P	
P	PUMP
PAC	PACKAGED AIR CONDITIONER
PP	PRIMARY PUMP
PTAC	PACKAGE TERMINAL AIR CONDITIONING
R	
RH	RELIEF HOOD
RHEF	RELIEF HOOD EXHAUST FAN
RTU	ROOF TOP UNIT
S	
SDB	SINGLE DUCT BOX
SP	SECONDARY PUMP
ST	CHILLED WATER STORAGE TANK
V	
VAV	VARIABLE AIR VOLUME BOX
VFD	VARIABLE FREQUENCY DRIVE

GENERAL MECHANICAL NOTES

1. INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING DRAWINGS AND SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER AND/OR ARCHITECT.
2. THE CONTRACTOR IS FULLY RESPONSIBLE FOR PERFORMING THE WORK IN FULL COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES UNDER THIS SECTION OF THE CONTRACT. IF THE CONTRACTOR DETERMINES THAT THE CONTRACT DOCUMENTS AND PLANS ARE NOT IN COMPLIANCE WITH THE APPLICABLE LOCAL CODES, HE SHALL INFORM THE ARCHITECT PRIOR TO CONSTRUCTION START FOR DIRECTION. FAILURE TO DO SO SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO MEET APPLICABLE LOCAL CODES, AND REWORK SHALL BE AT CONTRACTOR'S EXPENSE.
3. CONTRACTOR SHALL HANG AND INSTALL ALL DUCTWORK TIGHT WITH THE BUILDING STRUCTURE WHEN FEASIBLE TO ACCOMMODATE NEW CEILINGS. CONTRACTOR SHALL COORDINATE ALL INSTALLATION WORK WITH ARCHITECTURAL AND ELECTRICAL DESIGN. ALL DUCTWORK SHALL BE MODIFIED AS NECESSARY AND REQUIRED TO FIT AROUND BUILDING STRUCTURES, ARCHITECTURAL BUILD–OUT AND ELECTRICAL CABLE TRAY INSTALLATIONS. MECHANICAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE WORK SCOPE OF OTHER TRADES AND PARTICIPATE IN COORDINATING ALL CONSTRUCTION EFFORTS.
4. CONTRACTOR SHALL INSTALL ALL EXHAUST SYSTEMS, INCLUDING FANS AND EXHAUST DUCTS. PROVIDE COMPLETE NEW SYSTEMS AS INDICATED.
5. CONTRACTOR SHALL PROVIDE ALL CEILING DIFFUSERS AS SHOWN. CONNECT EACH DIFFUSER TO THE MAIN DISTRIBUTION DUCT WITH A FLEX–DUCT SECTION; CONNECTIONS SHALL BE COMPLETED IN ACCORDANCE WITH THE DETAIL. EACH FLEX–DUCT CONNECTION SHALL INCLUDE A BUTTERFLY DAMPER TO BE INSTALLED AT THE TRUNK DUCT.
6. CONTRACTOR SHALL PROVIDE ALL DUCTWORK REQUIRED TO COMPLETE THE HVAC SYSTEM. TIE IN BRANCH DUCTS TO MAIN DUCTS WITH SHEET METAL FLANGES. FLANGE CONNECTION SHALL BE FASTENED WITH CRIMPED SHEET METAL STRIPS AND SEALED WITH SILICONE CAULK.
7. CONTRACTOR SHALL SUPPLY AND INSTALL FIRE DAMPERS AND ACCESS DOORS IN THE HORIZONTAL DUCTS WHERE THEY PENETRATE FIRE BARRIERS.
8. CONTRACTOR SHALL PROVIDE FIRE DAMPERS IN ALL DIFFUSERS AND GRILLES LOCATED IN FIRE RATED CEILINGS. ALL HALLWAY DIFFUSERS AND GRILLES SHALL BE INSTALLED WITH FIRE DAMPERS. ALL DIFFUSERS AND GRILLES SHOWN WITH A CIRCLED "F" SHALL BE EQUIPPED WITH FIRE DAMPERS.
9. ALL OPENINGS CUT IN MASONRY AND PLASTER WALLS OR CONCRETE FLOORS SHALL BE CORE DRILLED OR SAWED WHEN POSSIBLE. CONTRACTOR SHALL CHECK BUILDING CONSTRUCTION BEFORE MAKING PENETRATIONS TO AVOID CUTTING THROUGH STRUCTURAL BEAMS AND REINFORCING. CONTRACTOR SHALL INFORM THE ENGINEER IF REINFORCING IS CUT OR DAMAGED WHILE MAKING OPENINGS. CONTRACTOR SHALL REINFORCE ALL OPENINGS AS REQUIRED BY DRAWINGS AND SPECIFICATIONS. PATCH AND SEAL OPENINGS WITH 6000 PSI CEMENT GROUT. INSTALL DECORATIVE TRIM (EQUIPMENT FLANGES, FRAMING OR ESCUTCHEONS) AROUND OPENINGS IN FINISHED AREAS. COORDINATE ALL CUTTING AND PATCHING WITH THE OTHER TRADES.
10. ON ANY WORK SHOWN ON MECHANICAL DRAWINGS REQUIRING DEMOLITION OF EXISTING OR NEW BUILDING STRUCTURES AND FINISHES, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLETE THE NECESSARY DEMOLITION. CONTRACTOR SHALL PATCH AND REPAIR ALL DEMOLITION WORK. PATCHING SHALL BE COMPLETED WITH THE SAME MATERIALS AS THE SURROUNDING AREAS, OR WITH ARCHITECT–APPROVED PATCHING MATERIALS. REPAIRS SHALL BE COMPLETED ACCORDING TO ARCHITECTURAL SPECIFICATIONS. ALL REFINISHING SHALL BE APPROVED BY THE ARCHITECT.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETING THE INSTALLATION OF THE AIR DISTRIBUTION SYSTEM SHOWN. DUCTWORK, DUCT ACCESSORIES AND CONTROLS SHOWN AND REQUIRED SHALL BE SUPPLIED AND INSTALLED. ALL INSTALLATION WORK SHALL BE DONE IN ACCORDANCE WITH APPLICABLE CODES, INCLUDING NFPA 90A AND 90B.
12. CONTRACTOR SHALL BALANCE ALL AIR DISTRIBUTION SYSTEMS TO ACHIEVE THE AIR VOLUME REQUIREMENTS INDICATED. BALANCING SHALL INCLUDE ADJUSTMENT OF ALL MANUAL VOLUME DAMPERS, SPLITTER DAMPERS, ZONE DAMPERS (IF REQUIRED), AND BUTTERFLY DAMPERS. CONTRACTOR SHALL SUPPLY THE ENGINEER WITH A COMPLETE BALANCING REPORT WHICH INCLUDES VOLUME, ROOM REFERENCE AND ZONE VOLUME TOTALS.
13. MOUNT ALL THERMOSTATS (SENSORS) 48" ABOVE THE FINISHED FLOOR LEVEL UNLESS NOTED OTHERWISE THERMOSTATS SHOWN SHALL BE IN CONTROL OF THE ZONE SYSTEM WHICH IS SUPPLYING AIR TO THE AREA WHERE THE THERMOSTAT IS LOCATED. CONTRACTOR SHALL COORDINATE THE FINAL LOCATION OF EACH THERMOSTAT WITH THE ROOM FINISHES AND USES. CONTRACTOR SHALL SUPPLY AND INSTALL ALL CONTROL VOLTAGE WIRING AND CONDUIT FOR THERMOSTAT (DDC CONTROL) INSTALLATION.
14. CONTRACTOR SHALL COORDINATE THE FINAL LOCATIONS OF ALL CEILING DIFFUSERS WITH LIGHTING INSTALLATIONS AND ARCHITECTURAL REFLECTED CEILING PLANS. MOVE THE DIFFUSER LOCATIONS IF REQUIRED TO AVOID OBSTRUCTIONS FROM DUCTWORK AND LIGHT FIXTURES. COORDINATE RELOCATION WITH ENGINEER.
15. CONTRACTOR SHALL INSTALL NEW REFRIGERANT PIPING FLUSH WITH THE BUILDING STRUCTURE AND MECHANICAL ROOM BOUNDARIES AS SHOWN. CONTRACTOR SHALL COORDINATE ALL INSTALLATION WORK WITH DUCTS AND ELECTRICAL CONDUIT. MECHANICAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE WORK SCOPE OF OTHER TRADES AND PARTICIPATE IN COORDINATING ALL CONSTRUCTION EFFORTS.
16. ALL PIPING SHALL BE INSULATED AND JACKETED. REFER TO THE SPECIFICATIONS. CONDENSER COILS ARE TO BE COATED IN ACCORDANCE WITH THE SPECIFICATIONS
17. VERIFY THE LOCATION OF ALL WALLS, PARTITIONS, DOORS, CABINETS, AND CEILINGS FROM ACTUAL FIELD MEASUREMENTS.
18. PROVIDE SMOKE DETECTOR AND SHUTDOWN CONTROLS ON AIR HANDLERS AND SUPPLY FANS. SMOKE DETECTORS SHALL BE PROVIDED, INSTALLED AND WIRED FOR SHUT DOWN BY DIVISION 26. PROVIDE BOTH SUPPLY AND RETURN SIDE DEVICES.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/MAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
(512) 777-4380
FAX (956) 664-0282
TBPE FIRM #F-312

Revision No.	Date	Description

STATE OF TEXAS
KYLE A. HUNTER
121984
LICENSED
PROFESSIONAL ENGINEER

Project No.:	32885.001
Issued:	11-06-2020
Drawn By:	JS
Checked By:	KH
Scale:	AS NOTED

Sheet Title

MECHANICAL GENERAL LEGEND

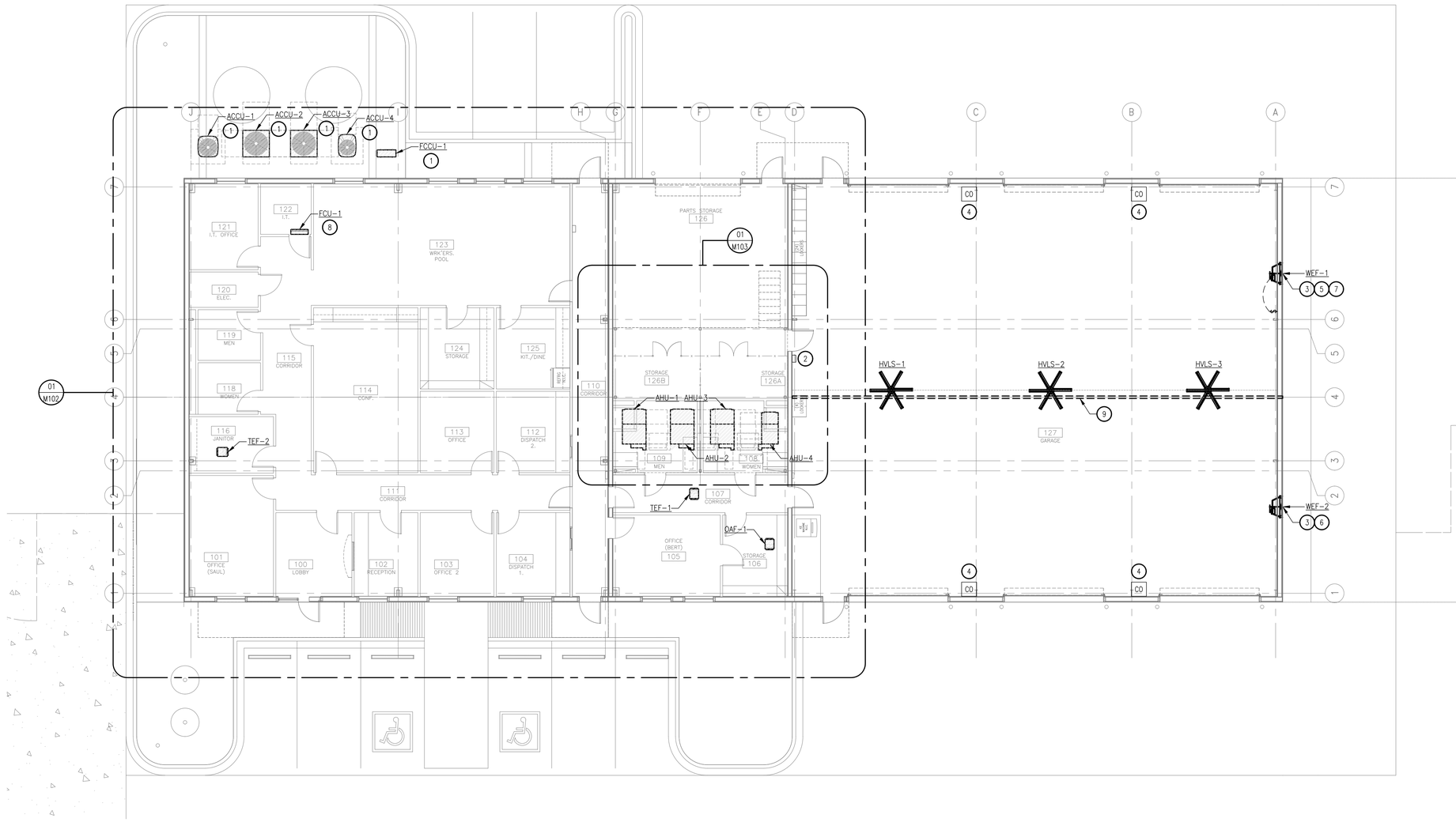
M001

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GENERAL NOTES:

1. REFER TO SHEET M001 FOR GENERAL MECHANICAL NOTES.
2. REFRIGERANT PIPING RUNS SHALL NOT EXCEED 100'.



KEY NOTES:

1. CONTRACTOR SHALL FURNISH AND INSTALL 6" HIGH HOUSE KEEPING PAD FOR MECHANICAL EQUIPMENT. CONCRETE PAD SHALL EXTEND 6" BEYOND ALL SIDES OF EQUIPMENT.
2. WALL MOUNTED HVLS FAN CONTROLLER. MOUNT AT 48"AFF. INSTALL PER MANUFACTURERS INSTRUCTIONS.
3. WALL MOUNTED EXHAUST FAN SHALL BE MOUNTED AT 60" A.F.F.
4. CO SENSOR MOUNTED AT 60" ABOVE FINISHED FLOOR.
5. WALL MOUNTED FAN SHALL BE OPERABLE PER MANUAL WALL MOUNTED SWITCH.
6. WALL MOUNTED FAN SHALL OPERATE PER BUILDING SCHEDULE TO PROVIDE CODE REQUIRED VENTILATION.
7. WALL MOUNTED FAN SHALL ENERGIZE UPON LOWEST LIMIT DETECTION OF CARBON MONOXIDE.
8. CONTRACTOR SHALL INSTALL FCU ABOVE DOOR. ROUTE REFRIGERANT LINES TO CONDENSING UNIT. REFER TO PLUMBING FOR CONDENSATE.
9. RIDGE VENT SHALL PROVIDE A MINIMUM OF 20 SQUARE FEET FREE AREA FOR EXHAUST MAKE-UP AIR.

01 MECHANICAL OVERALL PLAN

SCALE: 1/8" = 1'-0"

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
TBPE FIRM #F-312

Revision No.	Date	Description

STATE OF TEXAS
KYLE A. HUNTER
121984
LICENSED
PROFESSIONAL ENGINEER

Project No.:	32885.001
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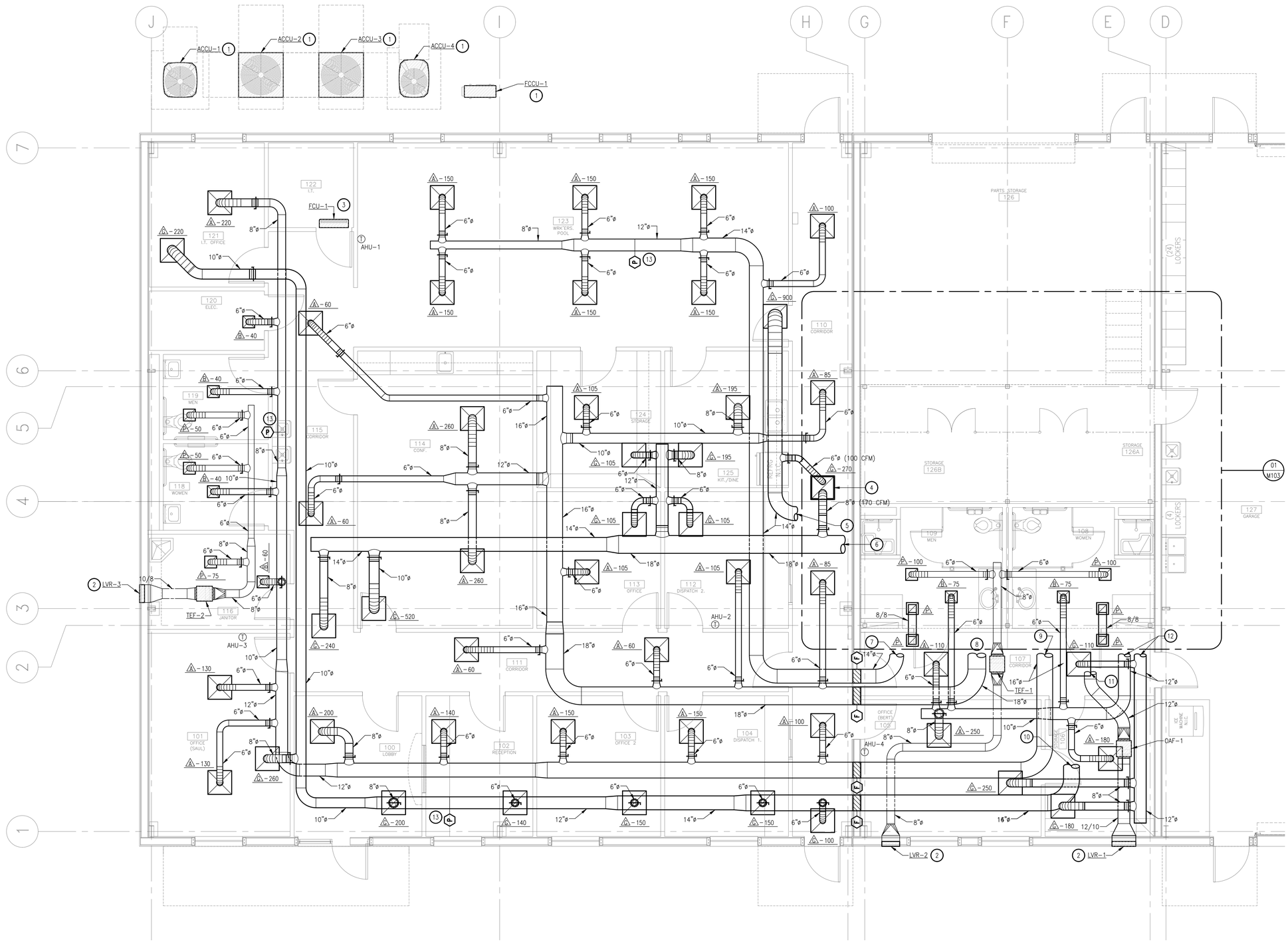
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MECHANICAL OVERALL PLAN

M101

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GENERAL NOTES:

1. REFER TO SHEET M001 FOR GENERAL MECHANICAL NOTES.
2. ALL REFRIGERANT PIPING RUNS SHALL BE LESS THAN 100' IN LENGTH.
3. FLEXIBLE DUCTWORK IS FOR ALIGMENT PURPOSES ONLY AND NOT INTENDED TO BE USED FOR CHANGE OF DIRECTION ASIDE FROM WHAT IS SHOWN IN DETAIL 4/M301.

KEY NOTES:

1. CONTRACTOR SHALL FURNISH AND INSTALL 6" HIGH HOUSE KEEPING PAD FOR MECHANICAL EQUIPMENT. CONCRETE PAD SHALL EXTEND 6" BEYOND ALL SIDES OF MECHANICAL EQUIPMENT.
2. COORDINATE FINAL LOCATION, ELEVATION, AND COLOR/FINISH WITH ARCHITECTURAL PLANS.
3. CONTRACTOR SHALL INSTALL FCU ABOVE DOOR. ROUTE REFRIGERANT LINES TO CONDENSING UNIT. REFER TO PLUMBING FOR CONDENSATE.
4. PREOVIDE AND INSTALL 8" HIGH SHEET METAL BOX WITH 4" LONG COLLARS, COLLAR DIAMETER AS SHOWN ON PLAN FOR EACH CORRESPONDING DUCT CONNECTION.
5. RETURN AIR DUCT TO ANU-1, REFER TO SHEET M103 FOR CONTINUATON.
6. RETURN AIR DUCT TO AHU-2, REFER TO SHEET M103 FOR CONTINUATION.
7. SUPPLY AIR DUCT TO AHU-1, REFER TO SHEET M103 FOR CONTINUATION.
8. SUPPLY AIR DUCT TO AHU-2, REFER TO SHEET M103 FOR CONTINUATION.
9. SUPPLY AIR DUCT TO AHU-3, REFER TO SHEET M103 FOR CONTINUATION.
10. RETURN AIR DUCT TO AHU-3, REFER TO SHEET M103 FOR CONTINUATION.
11. OUTSIDE AIR DUCT TO AIR HANDLING UNITS (AHU-1 THRU AHU-4), REFER TO SHEET M103 FOR CONTINUATION.
12. SUPPLY AND RETURN AIR DUCT TO AHU-4, REFER TO SHEET M103 FOR CONTINIATION.
13. REMOTE DUCT STATIC PRESSURE SENSOR LOCATED AT APPROXIMATELY 2/3's OF THE SUPPLY AIR DUCT LENGTH.

01 MECHANICAL PLAN
SCALE: 1/4" = 1'-0"

SUNSET PARK OPERATIONS FACILITY

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HIDALGO COUNTY PRECINCT ONE

HALFF
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MCALLEN, TEXAS 78503
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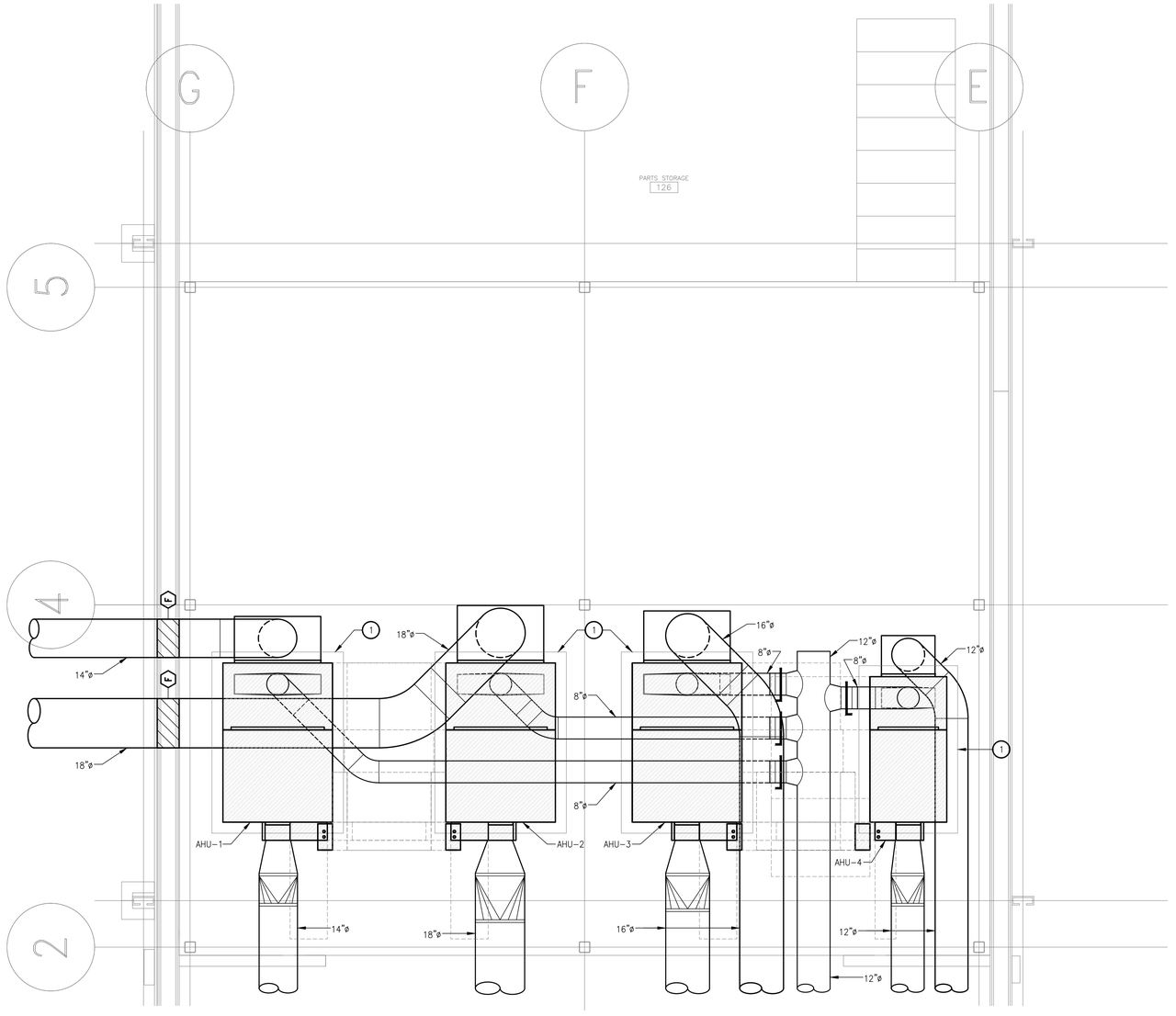
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MECHANICAL PLAN

M102
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GENERAL NOTES:

1. REFER TO SHEET M001 FOR GENERAL MECHANICAL NOTES.
2. REFER TO PLUMBING FOR PRIMARY AND SECONDARY ROUTING.



KEY NOTES: (i)

1. CONTRACTOR SHALL FURNISH AND INSTALL 12" HIGH RAISED FRAME STRUCTURE FOR MECHANICAL EQUIPMENT REFER TO DETAIL 02/M302.

01 MECHANICAL ENLARGED PLAN
SCALE: 1/2" = 1'-0"

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HIDALGO COUNTY PRECINCT ONE

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
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KYLE A. HUNTER
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MECHANICAL ENLARGED PLAN

M103

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SPLIT DX UNIT SCHEDULE

AIR HANDLING UNIT																					CONDENSING UNIT										SYSTEM EFFICIENCY		
TAG	MANUFACTURER	MODEL	SERVICE CLEARANCE	L x W x H (in)	WEIGHT (LBS)	AIRFLOW (CFM)	OUTSIDE AIR (CFM)	E.S.P. (in. WC)	POWER (HP)	SENSIBLE CAPACITY (BTUH)	TOTAL CAPACITY (BTUH)	EAT-DB °F	EAT-WB °F	LAT-DB °F	LAT-WB °F	HEATING EAT °F	HEATING LAT	HEATING KW	STAGES	VOLTAGE / PHASE	MCA	MOCP	TAG	MANUFACTURER	MODEL	SERVICE CLEARANCE	L x W x H (in)	WEIGHT (LBS)	AMBIENT AIR TEMP. °F	REFRIGERANT	VOLTAGE/ PHASE	MCA	MOCP	EER	SEER	NOTES
AHU-1	TRANE	BCHD036	RIGHT (37" ALL SIDES)	33.72X40X18	220	1000	100	1	1	27.56	40.53	80	67	54.88	53.81	65	83.9	6	SCR	208/3	26.59	30	ACCU-1	TRANE	4TTA4	36"	34X35X39	190	105	R-410A	208/3	18	30	12	14	ALL
AHU-2	TRANE	BCHD054	LEFT (37" ALL SIDES)	42X40X22	278	1500	180	1.5	1	41.56	61.35	80	67	54.74	53.67	65	86	10	SCR	208/3	41	45	ACCU-2	TRANE	TTA072	36"	45X45X38	240	105	R-410A	208/3	28	45	11.5	13.1	ALL
AHU-3	TRANE	BCHD054	RIGHT (37" ALL SIDES)	42X40X22	278	1400	140	1.5	1	40.88	61.97	80	67	53.4	52.4	65	85.3	9	SCR	208/3	37	40	ACCU-3	TRANE	TTA072	36"	45X45X38	190	105	R-410A	208/3	28	45	11.5	13.1	ALL
AHU-4	TRANE	BCHD024	LEFT (36" ALL SIDES)	33.72X28X18	160	700	70	1	1	20.11	29.44	80	67	53.81	53.2	65	85.32	4.5	SCR	208/3	21	25	ACCU-4	TRANE	4TTA4	36"	38X30X33	156	105	R-410A	208/3	12	20	12	14	ALL

NOTES:

1. CONTRACTOR TO PROVIDE CONCRETE PAD FOR CONDENSING UNITS.
2. PROVIDE WITH SINGLE POINT POWER FOR INDOOR UNIT AND INDEPENDENT SINGLE POINT POWER FOR OUTDOOR UNIT.
3. UNIT TO INCLUDE VARIABLE SPEED ECM MOTOR, MIXING BOX WITH ANGLED FILTERS, AND INTEGRATED UNIT CONTROLLER
4. PROVIDE HUMIDITY/TEMPERATURE COMBO THERMOSTAT WITH INTEGRATED ENCHANCED DEHUMIDIFICATION SEQUENCE TO RUN FAN AT LOW SPEED DURING DEHUMIDIFICATION CYCLE INITIATED WHEN SPACE IS ABOVE 65% RH.
5. PROVIDE HAIL GUARDS FOR CONDENSING UNIT.
6. PROVIDE DIGITAL SCROLL COMPRESSOR
7. PROVIDE ECOATED CONDENSER COILS TO MEET ASTM B117-90, ASTM D2247-92, AND ASTMD870-92 FOR 6,000 HOUR SALT SPRAY, 1,000 HOURS HUMIDDITY IMMERSION RESISTANCE AND 250 HOURS WATER IMMERSION RESISITANCE
8. PROVIDE MIXING BOX WITH LINKED OA/RA DAMPERS AND MODULATING NC ACTUATOR
9. PROVIDE HORIZONTALLY CONFIGURED UNITS
10. PROVIDE COIL PAN LEAK DETECTOR INTIGRATED WITH AHU OPERATION.
11. FACTORY MOUNTED SMOKE DETECTORS IN RETURN AIR.

HVAC DUCTWORK MATERIALS SCHEDULE

SERVICE	SHAPE	METAL TYPE	DUCT TYPE	JOINTS	W.G.	INSULATION			
						CONDITIONED SPACES	UNCONDITIONED SPACES		
SUPPLY LOW PRESSURE CONCEALED	ROUND/OVAL	GALVANIZED	SPIRAL	MASTIC & COUPLING	2"	2" AND 1.5LB/CF DENSITY	2" AND 1.5LB/CF DENSITY	N/A	
	RECTANGULAR	GALVANIZED	SINGLE WALL	SLIPS AND DRIVES	2"	2" AND 1.5LB/CF DENSITY	2" AND 1.5LB/CF DENSITY	RIGID: 3" AND 1.5LB/CF DENSITY	W/ FLEXCLAD 400 JACKET OUTDOORS
SUPPLY LOW PRESSURE EXPOSED	ROUND/OVAL	GALVANIZED	DOUBLE WALL WITH INSULATION	MASTIC & COUPLING	2"	DOUBLE WALL W/ INTERSTITUAL	DOUBLE WALL W/ INTERSTITUAL	N/A	
	RECTANGULAR	GALVANIZED	DOUBLE WALL WITH INSULATION	SLIPS AND DRIVES	2"	DOUBLE WALL W/ INTERSTITUAL	DOUBLE WALL W/ INTERSTITUAL	RIGID: 3" AND 1.5LB/CF DENSITY	W/ FLEXCLAD 400 JACKET OUTDOORS
RETURN AIR CONCEALED	ROUND	GALVANIZED	SPIRAL	MASTIC & COUPLING	-2"	2" AND 1.5LB/CF DENSITY	2" AND 1.5LB/CF DENSITY	N/A	
	RECTANGULAR	GALVANIZED	SINGLE WALL	SLIPS AND DRIVES	-2"	2" AND 1.5LB/CF DENSITY	2" AND 1.5LB/CF DENSITY	RIGID: 3" AND 1.5LB/CF DENSITY	W/ FLEXCLAD 400 JACKET OUTDOORS
RETURN AIR EXPOSED	ROUND	GALVANIZED	DOUBLE WALL WITH INSULATION	MASTIC & COUPLING	-2"	NONE	DOUBLE WALL W/ INTERSTITUAL	N/A	
	RECTANGULAR	GALVANIZED	DOUBLE WALL WITH INSULATION	SLIPS AND DRIVES	-2"	NONE	DOUBLE WALL W/ INTERSTITUAL	RIGID: 3" AND 1.5LB/CF DENSITY	W/ FLEXCLAD 400 JACKET OUTDOORS
GENERAL EXHAUST	ROUND	GALVANIZED	SPIRAL	MASTIC & COUPLING	-2"	NONE	2" AND 1.5LB/CF DENSITY	N/A	

WALL MOUNTED A/C UNIT SCHEDULE

	SYSTEM TAG	SYSTEM 1
	TAG REFERENCE	FCU-1/FCCU-1
OUTDOOR UNIT NOMINAL DATA	MODEL NUMBER	PUY-A12NKA7
	NOMINAL COOLING CAPACITY (BTU/h)	12,000.0
	NOMINAL HEATING CAPACITY (BTU/h)	14,000.0
	COOLING AMBIENT RANGE (HIGH/LOW) (°F)	115 / 0
	COOLING EFFICIENCY [SEER]	20.8
	HEATING COP @ 47°F [HSPF]	10.2
REFRIGERANT	TYPE	410a
	CHARGE	4 LBS., 7 OZ
DESIGN CONDITIONS	DESIGN COOLING OUTDOOR TEMP DB (°F)	105.0
	DESIGN HEATING OUTDOOR TEMP WB (°F)	43.0
	MAX PIPING LENGTH (FT)	100
	REFRIGERANT PIPE DIM. HIGH/LOW PRESSURE (INCH) (SEE NOTE 4)	1/4 / 1/2
PERFORMANCE DATA	CORRECTED COOLING TOTAL CAPACITY (BTU/h)	10,685.2
	CORRECTED HEATING CAPACITY (BTU/h)	13,628.3
	SOUND PRESSURE (dBA)	44/46
ELECTRICAL DATA	VOLTAGE / PHASE	208/230V / 1-PHASE
	MCA 208/230	11
	RECOMMENDED FUSE SIZE (RFS)	15
	MOCP	28
INDOOR UNIT NOMINAL DATA	MODEL	PKA-A12HA7
	TYPR	WALL-MOUNTED
	NOMINAL COOLING CAPACITY (BTU/h)	12,000.0
		14,000.0
DESIGN CONDITIONS	COOLING DESIGN ENTERING TEMP DB/WB (°F)	80.0/67.0
	HEATING DESIGN ENTERING TEMP DB/WB (°F)	70.0
	REFRIGERANT PIPE DIM LIQUID/SUCTION (INCH)	1/2 / 1/4
PERFORMANCE DATA	COOLING TOTAL CAPACITY (BTU/h)	10,685.2
	COOLING SENSIBLE CAPACITY (BTU/h)	9,206.7
	HEATING CAPACITY (BTU/h)	13,628.3
	ESTIMATED COOLING COIL LAT (°F)	59.5
	ESTIMATED HEATING COIL LAT (°F)	99.7
FAN / WATER FLOW DATA	FAN SPEED SETTING	HIGH
	PEAK FAN AIRFLOW (CFM)	425
	SOUND PRESSURE PER FAN SPEED 208V/230V (dBA)	36 - 40 - 43
ELECTRICAL DATA	VOLTAGE / PHASE	208/230V/1-PHASE
	POWER COOLING 208V/230V (kW)	1
	POWER HEATING 208V/230V (kW)	0.95
	ELECTRICAL MCA/MFS	POWERED BY OUTDOOR
NOTES	APPLICABLE SYSTEM NOTES - SEE NOTES BELOW	ALL

NOTES:

1. NOMINAL COOLING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 80/67°F (DB/WB), OUTDOOR OF 95°F (DB)
2. NOMINAL HEATING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 70°F (DB), OUTDOOR OF 43°F (WB)
3. EFFICIENCY VALUES FOR EER, IEER, COP ARE BASED ON AHRI 1230 TEST METHOD FOR MIXTURE OF DUCTED & NON-DUCTED INDOOR UNITS.
4. SEE SCHEMATIC PIPING/CONTROL DIAGRAM FOR INDICATION OF REQUIRED INDOOR UNIT REMOTE CONTROLLERS, SYSTEM CONTROLLERS, AND INTEGRATION DEVICES.
5. FULL DEMAND CORRECTED CAPACITY INCLUDES DE-RATE ASSOCIATED WITH INDOOR VS. OUTDOOR CONNECTED CAPACITY INDICATED ON OUTDOOR UNIT SCHEDULE FOR ASSOCIATED SYSTEM. PARTIAL CORRECTED CAPACITY ASSUMES SUFFICIENT DIVERSITY EXISTS SUCH THAT THE CONNECTED CAPACITY DE-RATE DOES NOT APPLY. IT IS THE DESIGNER'S RESPONSIBILITY TO ENSURE "DIAMOND SYSTEM BUILDER" IS SET IN THE APPROPRIATE OUTPUT CAPACITY SETTING (FULL DEMAND/PARTIAL DEMAND) PRIOR TO GENERATING THIS SCHEDULE.
6. PROVIDE WITH CONDENSATE PUMP.

HIGH VOLUME LOW SPEED FAN SCHEDULE

MARK	DIAMETER	BLADE QTY	HP	RPM	DRIVE	WEIGHT (LBS)	MAX AFFECTED AREA (FT^2)	VOLT/ PHASE	MCA/ MOCP	MANUFACTURER	MODEL
HVLS-1	8	6	1/4	140	DIRECT	59	2,200	208/1	3/5	MACROAIR	AVD 370
HVLS-2	8	6	1/4	140	DIRECT	59	2,200	208/1	3/5	MACROAIR	AVD 370
HVLS-3	8	6	1/4	140	DIRECT	52	1,300	208/1	3/5	MACROAIR	AVD 370

NOTES:

1. FAN SHALL BE DIRECT DRIVE; NO VFD REQUIRED.
2. FAN SHALL BE VARIABLE SPEED.
3. PROVIDE FAN WITH FACTORY FUSED DISCONNECT.
4. PROVIDE "CONTROLLER 4" FAN CONTROLLER.
5. PROVIDE FAN WITH ALL NECESSARY MOUNTING HARDWARE, WITH ANGLE MOUNT KIT.
6. PROVIDE FAN WITH 50,000 HOUR WARRANTY.
7. PROVIDE FAN WITH 12 YEAR WARRANTY.
8. ENTIRE FAN ASSEMBLY SHALL BE UL LISTED.

FAN SCHEDULE

MARK	CFM	SERVICE	LOCATION	TYPE	RPM	EXT SP (IN WG)	MOTOR HP	DRIVE	VOLTAGE/PH	CONTROL	MAX. SONES	WEIGHT (LBS)	MANUFACTURER	MODEL	NOTES
TEF-1	200	RR 108,109	ABOVE CEILING	IN-LINE	1,725	0.5	1/10	DIRECT	115/1	BUILDING SCHDL.	7.4	50	GREENHECK	SQ-80-VG	1,2,3
TEF-2	175	RR 118,119 & JAN 116	ABOVE CEILING	IN-LINE	1,725	0.5	1/10	DIRECT	115/1	BUILDING SCHDL.	7.4	50	GREENHECK	SQ-80-VG	1,2,3
WEF-1	5,000	GARAGE 127	WALL	WALL	580	0.15	3/4	BELT	208/1	CO SYSTEM/SWITCH	12.0	92	GREENHECK	SBE-2H30	1,2,3,5,7
WEF-2	5,000	GARAGE 127	WALL	WALL	580	0.15	3/4	BELT	208/1	CO SYSTEM	12.0	92	GREENHECK	SBE-2H30	1,2,3,5,7
OAF-1	490	AHU-1, AHU-2,AHU-3 & AHU-4	ABOVE CEILING	IN-LINE	1,725	0.6	1/6	DIRECT	115/1	BUILDING SCHDL.	9.2	50	GREENHECK	SQ-95-VG	1,2,3

NOTES

1. FAN SHALL HAVE FACTORY INSTALLED, PRE-WIRED INTEGRAL DISCONNECT SWITCH FROM FACTORY. CERUS MODEL 1-P.
2. FAN SHALL BE PROVIDED WITH BACK DRAFT DAMPER.
3. FAN SHALL BE PROVIDED WITH FACTORY-MOUNTED SPEED CONTROL.
4. PROVIDE 14" GALVANIZED ROOF CURB.
5. PROVIDE OSHA APPROVED WIRE GUARD, WALL COLLAR, AND WEATHER HOOD.
6. RELAY INTERLOCK WITH AIR COMPRESSOR SHALL ENERGIZE AT SAME TIME.
7. REFER TO KEYNOTES ON SHEET M101 AND DETAIL 1/

GENERAL NOTES, TYPICAL OF ALL FANS:

A. CONTRACTOR SHALL CONFIRM DUCT PENETRATIONS, WEIGHT SHALL NOT EXCEED SCHEDULED PRODUCT.
B. ALL FANS INCLUDE DRIVE LOSSES.
C. SUPPLIER SHALL PROVIDE DRIVE LOSS CALCULATIONS WITH EACH FAN DURING SUBMITTALS.
D. SOUND POWER LEVELS/SONES AND FAN RPM SHALL NOT EXCEED SCHEDULED VALUES.
E. UNIT WEIGHT INCLUDES ACCESSORIES AND CURB FOR ROOF MOUNTED EQUIPMENT.

LOUVER SCHEDULE

MARK	SERVES	CFM	WIDTH (IN)	HEIGHT (IN)	MINIMUM FREE AREA (FT2)	MAX. PRESSURE DROP AT 750 FPM INTAKE (INCH W.G.)	GREENHECK MODEL	NOTES
LVR-1	OAF-1	490	24	24	1.64	0.08	EVH-501D	ALL
LVR-2	TEF-1	200	18	12	0.40	0.08	EVH-501D	ALL
LVR-3	TEF-2	200	18	12	0.40	0.08	EVH-501D	ALL

NOTES:

1. FINISH SHALL BE KYNAR FINISH. PAINT COLOR BY ARCHITECT. COORDINATE FINAL ELEVATION LOCATION WITH ARCHITECT.
2. LOUVER SHALL PROVIDE MINIMUM 99% EFFECTIVENESS IN PREVENTING WATER PENETRATION WIND DRIVEN RAIN TEST (29 mph, 3 in/hr).
3. LOUVER SHALL HAVE A FLANGED FACE.
4. PROVIDE BACKDRAFT DAMPER.

GRILLE/DIFFUSER/REGISTER SCHEDULE

MARK	SERVICE	DESCRIPTION	MANUFACTURER MODEL NO.	MAX. NC. LEVEL (1)	REMARKS
A	SUPPLY	24"X24" MODULE SIZE, ALUMINUM, LOUVERED, LAY IN DIFFUSER WITH 4 WAY THROW, ROUND NECK, FACE SIZE AS INDICATED BELOW.	TITUS OMNI-AA	30	#26 WHITE FINISH
B	SUPPLY	12"X12" MODULE SIZE, ALUMINUM, LOUVERED, SURFACE-MOUNTED DIFFUSER WITH 4-WAY THROW, ROUND NECK, FACE SIZE AS INDICATED BELOW.	TITUS OMNI-AA	30	#26 WHITE FINISH
G	RETURN	24"X24" EGGCRATE FACE, CEILING RETURN GRILL WITH BORDER FOR LAY-IN CEILING, ALUMINUM CONSTRUCTION.	TITUS 50F	30	#26 WHITE FINISH
I	RETURN	12"X12" EGGCRATE FACE, CEILING RETURN GRILLE, SURFACE MOUNTED, ALUMINUM CONSTRUCTION.	TITUS 50F	30	#26 WHITE FINISH
J	RETURN	SURFACE MOUNTED RETURN GRILLE WITH 3/4" SPACING. ALUMINUM CONSTRUCTION, 35° DEFLECTION.	TITUS 350FL	30	#26 WHITE FINISH
P	RETURN	12"X12" EGGCRATE FACE, CEILING RETURN GRILLE, SURFACE MOUNTED, ALUMINUM CONSTRUCTION WITH OBD.	TITUS 63FL	30	#26 WHITE FINISH

F =THIS WILL DESIGNATE A STEEL FIRE RATED AIR DEVICE TYPE.
CBA =COLOR BY ARCHITECT

AIR OUTLET DESIGNATION ON PLANS
MARK A - 200 AIR FLOW (CFM)
12 X 8 RECTANGULAR FACE SIZE (WHERE APPLICABLE)

* SEE ARCHITECTURAL DRAWINGS PROPER BORDER TYPES

CAPACITY	FACE	NECK/FLEXIBLE CONNECTION
0-150	6 X 6	6"
151-285	9 X 9	8"
286-440	12 X 12	10"
441-550	12 X 12	12"
551-750	15 X 15	14"
750-1000	18 X 18	16"

NOTE: COORDINATE ALL AIR DEVICE TYPE WITH ARCHITECTURAL REFLECTED CEILING PLAN.

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MCALLEN, TEXAS 78503
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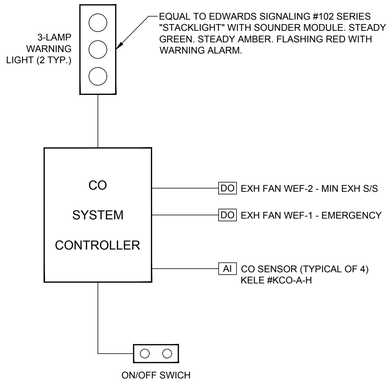
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MECHANICAL SCHEDULES

M201
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SEQUENCE OF OPERATIONS
SHOP VENTILATION

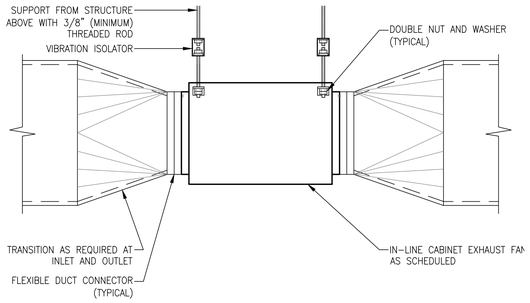
1. . SYSTEM SHALL BE ACTIVATED MANUALLY BY USER INPUT OR AUTOMATICALLY BY SCHEDULED OPERATION.
2. . UPON START SIGNAL, EXHAUST FAN, WEF-2 SHALL START AND RUN CONTINUOUSLY DURING THE OCCUPIED PERIOD.
3. . SYSTEM CARBON MONOXIDE SENSORS SHALL CONTINUOUSLY MONITOR CO LEVELS. DEPENDING UPON CO LEVEL AT THE HIGHEST RECORDED SENSOR, ONE OF THE FOLLOWING CONDITIONS WILL BE PRESENT:

STAGE	CO LEVEL	WEF-2	WEF-1	NOTIFICATION LIGHT	DOOR SIGNAL
NORMAL	< 30 PPM	ON	OFF	GREEN	-
CAUTION	30 ≤ CO <70 PPM	ON	ON - HIGH (A)	AMBER	-
EMERGENCY	≥ 70 PPM	ON	ON - HIGH (B)	RED (D)	N/A

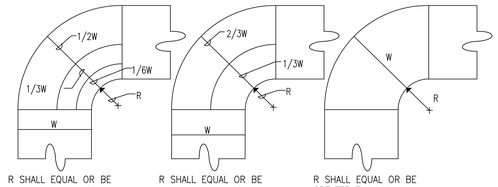
A. WEF-2 = 5000 CFM
B. WEF-1 = 5000 CFM
C. DOOR SIGNAL = N/A
D. WARNING HORN SHALL SOUND AT THIS LEVEL

4. . SYSTEM SHALL OPERATE AUTOMATICALLY EXCEPT UNDER > 70 PPM CONDITION. SHOULD EMERGENCY VENTILATION BE REQUIRED, THE OVERHEAD DOOR WILL REQUIRE MANUAL CLOSURE ONCE SYSTEM HAS RETURNED TO NORMAL CONDITION.
5. . ADD SIGNAGE BELOW 3-LAMP WARNING LIGHT, VISIBLE FROM 50 FT. PROVIDING DIRECTION TO MANUALLY OPE DOOR ONCE AUDIBLE ALARM IS ENERGIZED.

11 CONTROL DIAGRAM - SHOP VENTILATION
N.T.S.

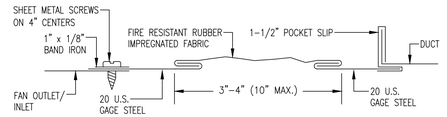


09 IN-LINE CABINET FAN INSTALLATION
N.T.S.

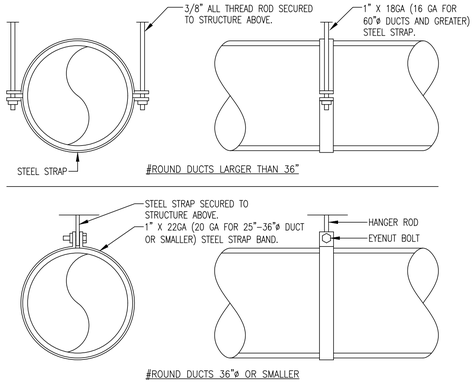


NOTES:
1. THE INTERIOR SURFACE OF ALL RADIUS ELBOWS SHALL BE MADE ROUND
2. ALL STANDARD RADIUS ELBOWS SHOWN ON PLANS MAY BE MADE SHORT RADIUS ELBOWS. ALL SHORT RADIUS ELBOWS SHALL HAVE VANES. VANES SHALL BE CONSTRUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA.

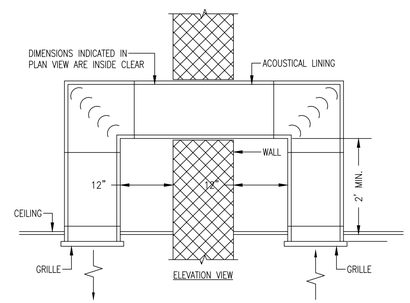
06 RADIUS DUCT ELBOW
N.T.S.



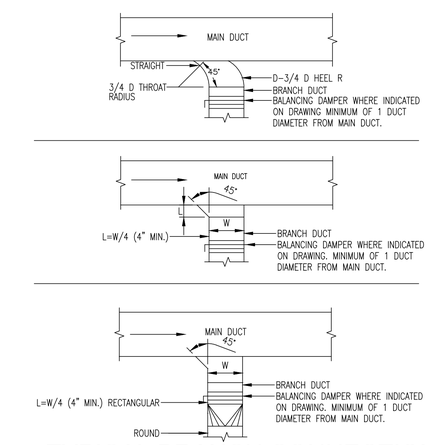
03 FLEXIBLE CONNECTION
N.T.S.



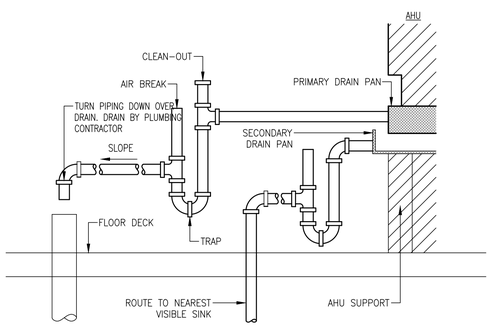
08 EXPOSED AND CONCEALED ROUND DUCT HANGER
N.T.S.



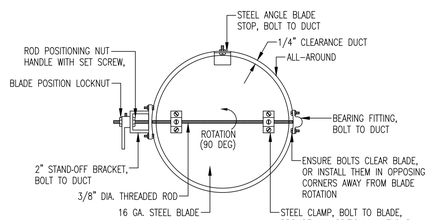
05 TRANSFER DUCT
N.T.S.



02 TYPICAL BRANCH CONNECTION
N.T.S.

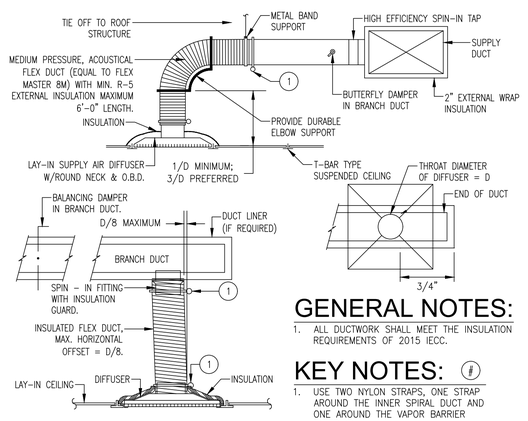


10 CONDENSATE DRAIN - AHU (DECK MOUNTED)
N.T.S.



NOTES:
A. DAMPERS FOR RECTANGULAR DUCTS SHALL BE SIMILAR TO THE DAMPER SHOWN ABOVE.
B. ENSURE THAT FULL 90° DAMPER BLADE MOVEMENT IS UNOBSTRUCTED.
C. FOR DUCT HEIGHTS MORE THAN 12", PROVIDE FACTORY-FABRICATED OPPOSED BLADE DAMPERS

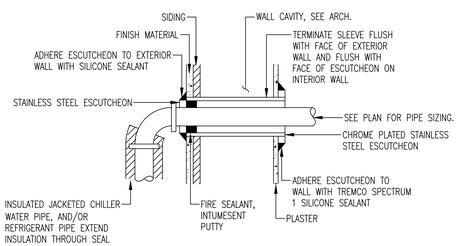
07 ROUND MANUAL DAMPER (ADJUSTABLE SINGLE BLADE)
N.T.S.



GENERAL NOTES:
1. ALL DUCTWORK SHALL MEET THE INSULATION REQUIREMENTS OF 2015 IECC.

KEY NOTES: (#)
1. USE TWO NYLON STRAPS, ONE STRAP AROUND THE INNER SPIRAL DUCT AND ONE AROUND THE VAPOR BARRIER EXTERIOR.

04 SUPPLY AIR DIFFUSER
N.T.S.



01 TYPICAL EXTERIOR WALL PENETRATION
N.T.S.

SUNSET PARK OPERATIONS FACILITY
HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
PH. (956) 664-0202
FAX (956) 664-0282
TBPE FIRM #F-312

Revision No.	Date	Description

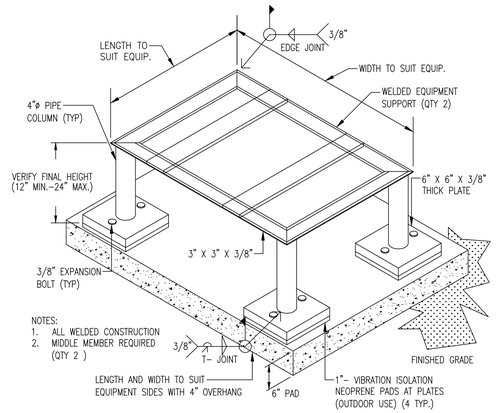
KYLE A. HUNTER
121984
LICENSED PROFESSIONAL ENGINEER
11-06-2020

Project No.:	32885.001
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Drawn By:	JS
Checked By:	KH
Scale:	AS NOTED

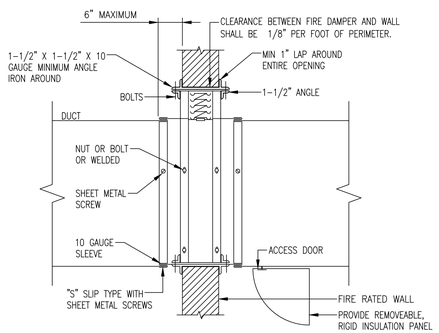
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MECHANICAL DETAILS

M301
Sheet Number

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02 SUPPORT FRAME - AHU (TYPICAL
N.T.S.



NOTE:

PROVIDE FIRE DAMPER FOR ROUND DUCT OR USE TRANSITIONS FOR ROUND TO SQUARE DUCT.

FIRE DAMPER SHALL NOT EXCEED 0.02" PRESSURE DROP AT CFM/SIZE SHOWN ON PLANS.

01 FUSIBLE LINK FIRE DAMPER
N.T.S.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0020
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STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

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MECHANICAL DETAILS

M302
Sheet Number

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PLUMBING ABBREVIATIONS

A

AB	ASSEMBLY BILL
ABS	ACRYLONITRILE BUTADIENE STYRENE
ABV	ABOVE
AC	AIR COMPRESSOR
ACCU	AIR COOLED CONDENSING UNIT
AD	AREA DRAIN
ADA	AMERICAN WITH DISABILITIES ACT
ADJ	ADJUSTABLE
AD	ACCESS DOOR
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AFS	ABOVE FINISH SURFACE
AHU	AIR HANDLING UNIT
AL	ALUMINIUM
AMP	AMPERE(S)
AP	ACCESS PANEL
APPROX	APPROXIMATE
ARCH	ARCHITECT, ARCHITECTURAL
AS	AIR SEPARATOR
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS
ATF	AUTOMATIC TRANSMISSION FLUID
AUX	AUXILIARY
AV	AIR VENT
AW	ACID WASTE

B

B	BOILER
BD	BLOW-DOWN
BEL	BELOW
BFF	BELOW FINISH FLOOR
BFP	BACKFLOW PREVENTER
BFV	BUTTERFLY VALVE
BHP	BRAKE HORSEPOWER
BKR	BREAKER
BLDG	BUILDING
BOD	BOTTOM OF DUCT
BOI	BID OPTION ITEM
BOP, B.O.P.	BOTTOM OF PIPE
BOS	BOTTOM OF STEEL
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BV	BALL VALVE
BWV	BACK WATER VALVE

C

CA	COMPRESSED AIR
CAP	CAPACITY
CBV	CALIBRATED BALANCE VALVE
CD	CONDENSATE DRAIN
CDF	CONDENSATE DRAIN FUNNEL
CDP	CONDENSATE DRAIN PUMP
CF	CUBIC FEET
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CI	CAST IRON
CIRC	CIRCULATING
℄	CENTER LINE
CLG	CEILING
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
COL	COLUMN
COND	CONDENSATE
CONN	CONNECT, CONNECTION
CONT	CONTINUE, CONTINUATION
COTG	CLEANOUT TO GRADE
CONTR	CONTRACTOR
CP	CIRCULATING PUMP
CPVC	CHLORINATED POLYVINYL CHLORIDE
CR	CONDENSATE RECEIVER
CRAC	COMPUTER ROOM AIR CONDITIONING
CU	CONDENSING UNIT
CW	DOMESTIC COLD WATER
°C	DEGREES CELSIUS

D

D	DEPTH
dB	DECIBEL
DESIG	DESIGNATION
DEG	DEGREE(S)
DFU	DRAINAGE FIXTURE UNIT
DIA OR ø	DIAMETER
DIM	DIMENSION
DISC	DISCONNECT
DISCH	DISCHARGE
DIST	DISTANCE
DN	DOWN
DS	DOWNSPOUT
DWG(S)	DRAWING(S)
DWH	DOMESTIC WATER HEATER

E

(E)	EXISTING
EA	EACH
ECC	ECCENTRIC
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EFF	EFFICIENCY
ELEV, EL	ELEVATION
ELEC	ELECTRICAL
ENCL	ENCLOSURE
EQ	EQUAL
EQUIP	EQUIPMENT
EQV	EARTHQUAKE VALVE
ET	EXPANSION TANK
EXH	EXHAUST
EXT	EXTERNAL
EXP. JOINT	EXPANSION JOINT
EWC	ELECTRIC WATER COOLER
EWS	EMERGENCY SHOWER AND EYE WASH

F

°F	DEGREE FAHRENHEIT
FC	FAN COIL
FCO	FLOOR CLEANOUT
FCW	FILTERED COLD WATER
FD	FLOOR DRAIN
FFE, F.F.E.	FINISH FLOOR ELEVATION
FGE, F.G.E.	FINISH GRADE ELEVATION
FIN	FINISH
FLA	FULL LOAD AMPS
FLR	FLOOR
FP	FIRE PROTECTION
FPM	FEET PER MINUTE
FS	FLOOR SINK
FT	FOOT, FEET
FWD	FOOD WASTE DISPOSER

G

G	NATURAL GAS (LOW PRESSURE)
GA	GAUGE, GAGE
GAL,	GALLON
GALV	GALVANIZED
GL	GRID LINE
GM	GAS METER
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPR	GAS PRESSURE REGULATOR
GRS	GREASE
GW	GREASE WASTE (KITCHEN)

H

H	HEIGHT
HB	HOSE BIBB
HC	HEATING COIL
HD	HEAD
HOA	HAND-OFF-AUTOMATIC
HORIZ	HORIZONTAL
HP	HORSE POWER
HPW	HIGH PRESSURE WATER
HTG	HEATING
HTR	HEATER
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HW	DOMESTIC HOT WATER (SUPPLY)
HWR	DOMESTIC HOT WATER RETURN
HZ	HERTZ

I

ICW	INDUSTRIAL COLD WATER
ID	INSIDE DIAMETER
I.E., IE	INVERT ELEVATION
IN	INCH
IN WG	INCHES WATER GAUGE
IN W.C.	INCHES OF WATER COLUMN
IT	INFORMATION TECHNOLOGY
IW	INDUSTRIAL WASTE

J

J-BOX	JUNCTION BOX

K

KW	KILOWATT
KWH	KILOWATT-HOUR

L

L	LAVATORY
LBS OR #	POUND(S)
LF	LINEAR FEET
LO	LUBRICATING OIL
LOC	LOCATION

M

MAX	MAXIMUM
MBH	1000 BTU PER HOUR
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MPG	MEDIUM PRESSURE GAS
MS	MOP SINK
MTD	MOUNTED
MV	MIXING VALVE

N

N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO.	NUMBER
NOM	NOMINAL
N.T.S., NTS	NOT TO SCALE

O

OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OVERFLOW
OH	OVERHEAD
OMS	ORGANIZATIONAL MAINTENANCE SHOP
OPNG	OPENING
OPER	OPERATING
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

P

P	PUMP
PCD	PUMP CONDENSATE DRAIN
PD	PRESSURE DROP, PERIMETER DRAIN
PH	PHASE
PLBG	PLUMBING
PLC	PUMP LEVEL CONTROL(S)
PNL	PANEL
POC	POINT OF CONNECTION
POD	POINT OF DISCONNECT
PRESS	PRESSURE
PRS	PRESSURE REDUCING STATION
PRV	PRESSURE REDUCING VALVE
PS	PRESSURE SWITCH
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAUGE
PSV	PRESSURE SAFETY VALVE
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE

Q

QTY	QUANTITY

R

(R)	RELOCATED
RD	ROOF DRAIN
RE:	REFERENCE, REFER
RECIRC	RECIRCULATE
REINF	REINFORCING
REQD	REQUIRED
REV	REVISION, REVISE
RICB	REFRIGERATOR ICE CONNECTION BOX
RLA	RUNNING LOAD AMPERES
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
RW	RAIN WATER
RWH	RAIN WATER HARVESTING

S

S	SOIL (SANITARY SEWER)
SD	STORM DRAIN
SECT	SECTION
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SH	SHOWER
SHD	SHOWER DRAIN
SF	SQUARE FEET
SHT	SHEET
SIM	SIMILAR
SHT MTL	SHEET METAL
SK	SINK
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SOV	SHUT-OFF VALVE
SP	SUMP PUMP
SPEC	SPECIFICATION
SQ	SQUARE
SS	STAINLESS STEEL, SERVICE SINK
STD	STANDARD
STL	STEEL
STRUC	STRUCTURAL
SURF	SURFACE
SUSP	SUSPEND
SW	COLD WATER (SOFT)
SV	SUPPLY VALVE
SYM	SYMBOL
S=%	SLOPE AT PERCENTAGE SHOWN

T

TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
THRU	THROUGH
TMV	THERMOSTATIC MIXING VALVE
TOP, T.O.P.	TOP OF PIPE
TP	TRAP PRIMER OR TRAP PRIMING
TYP	TYPICAL
TW	TEPID WATER

U

U	URINAL
U/C	UNDER CUT
U/F	UNDER FLOOR
U/G	UNDER GROUND
U/S	UNDER SLAB
UFC	UNIFIED FACILITIES CRITERIA
UTR	UP THROUGH ROOF
UL	UNDERWRITERS LABORATORIES, INC.
UNO	UNLESS NOTED OTHERWISE
UPS	UNINTERRUPTIBLE POWER SUPPLY
USB	UNIT STORAGE BUILDING

V

V	VENT
VAC	VOLTAGE ALTERNATING CURRENT
VBF	VENT BELOW FLOOR
VEL	VELOCITY
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
VLV	VALVE
VOR	VALVE ON RISER
VTR	VENT THROUGH ROOF

W

W	WASTE
W/	WITH
W/O	WITHOUT
WAP	WALL ACCESS PANEL
WC	WATER CLOSET
w.c.	WATER COLUMN
WCO	WALL CLEANOUT
WF	WASH FOUNTAIN
WHA	WATER HAMMER ARRESTER
WM	WATER METER
WP	WEATHER PROOF
WPD	WATER PRESSURE DROP
WR	WATER RISER
WS	WATER SOFTENER
WSFU	WATER SUPPLY FIXTURE UNIT
WT	WEIGHT

X

XFMR	TRANSFORMER

PLUMBING SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	SANITARY WASTE LINE		BALL VALVE
	VENT LINE		CHECK VALVE
GW	GREASE WASTE LINE		GATE VALVE
AW	ACID WASTE LINE		GAS COCK
RD	PRIMARY ROOF DRAIN LINE		BALANCING VALVE
OD	SECONDARY OVERFLOW ROOF DRAIN LINE		WATER HAMMER ARRESTOR
CD	CONDENSATE DRAIN LINE		GLOBE VALVE
	DOMESTIC COLD WATER	FCO	FLOOR CLEANOUT
	DOMESTIC HOT WATER (110°F)	YCO	YARD CLEANOUT
120°F	DOMESTIC HOT WATER (120°F)		FLOOR DRAIN
140°F	DOMESTIC HOT WATER (140°F)		FLOOR SINK
	DOMESTIC HOT WATER RETURN LINE		ROOF DRAIN / OVERFLOW ROOF DRAIN
TW	DOMESTIC TEPID WATER LINE		HOSE BIBB
CA	COMPRESSED AIR LINE		WALL HYDRANT
G	NATURAL GAS LINE		UNION
	EXISTING TO NEW CONNECTION		BRANCH – TOP CONNECTION
			BRANCH – BOTTOM CONNECTION
			PIPE RISE
			PIPE DROP
		P-1	PLUMBING RISER DESIGNATION
		D1 P1.01	PLUMBING DETAIL REFERENCE

NOTE: NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT

GENERAL PLUMBING NOTES:

A. INFORMATION ON THIS PLAN IS SCHEMATIC IN NATURE AND SHALL BE CONFIRMED IN THE FIELD AFTER COORDINATION WITH OWNER AND USER GROUPS.

B. PLUMBING CONTRACTOR SHALL ADHERE TO ALL CITY CODES, ORDINANCES, AND OTHER STATE AND LOCAL CODES THAT HAVE AUTHORITY OVER THIS PROJECT.

C. PLUMBING CONTRACTOR SHALL EXTEND ALL CONDENSATE AND INDIRECT DRAINS FROM EQUIPMENT TO FLOOR DRAIN AND/OR FLOOR SINK OR AS INDICATED ON PLUMBING PLANS.

D. PLUMBING CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR ANY INSTALLATION OF PIPING AND DUCTWORK PRIOR TO BEGINNING OF CONSTRUCTION

E. PLUMBING CONTRACTOR SHALL TERMINATE ALL WATER ROUGH-IN WITH SHUT-OFF VALVES BEFORE CONNECTING TO EQUIPMENT AND RELATED FIXTURES.

F. REFER TO ARCHITECTS DRAWINGS FOR MOUNTING HEIGHTS OF ALL PLUMBING FIXTURES.

G. INSULATE "P" TRAPS AND SUPPLIES AT HANDICAP LAVATORIES WITH INSULATION KIT.

H. PROVIDE VACUUM BREAKER TO ALL FIXTURES WITH HOSE CONNECTION AND APPLIANCES WITH DIRECT CONNECTIONS TO DOMESTIC WATER.

I. ALL FLOOR DRAINS AND/OR FLOOR SINKS SHALL BE PROVIDED WITH TRAP PRIMER CONNECTION.

J. PROVIDE STOPS AND WATER HAMMERS AT EACH FIXTURE OR GROUP OF FIXTURES.

K. ALL VENTS THROUGH ROOF SHALL BE FLASHED A MINIMUM OF 12" ABOVE ROOF. ALL VENTS SHALL BE MINIMUM OF 15' AWAY FROM ANY OUTSIDE INTAKE.

L. PROVIDE CEILING ACCESS PANEL FOR WATER ISOLATION VALVES, WATER HAMMER ARRESTORS AND TRAP PRIMER VALVES LOCATED IN OTHERWISE INACCESSIBLE AREAS.

M. PROVIDE INTUMESENT PUTTY AND SLEEVE ALL PIPING CROSSING FIRE RATED WALLS.

N. SLEEVE ALL OUTSIDE WALL, FLOOR SLAB, AND BEAM PENETRATIONS. COORDINATE WITH STRUCTURAL ENGINEER PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT.

O. DOMESTIC WATER LINE SHALL BE ROUTED, SO AS TO AVOID CROSSING OVER LIGHT FIXTURES WHERE POSSIBLE AND ELECTRICAL PANELS IN ALL CASES.

P. PLUMBING CONTRACTOR SHALL COORDINATE EXACT LOCATION OF UTILITIES WITH CIVIL ENGINEER, AND CITY PRIOR TO INSTALLATION. FAILURE TO COMPLY SHALL RESULT IN CORRECTING AT NO COST TO THE OWNER REPRESENTATIVE.

Q. GENERAL CONTRACTOR TO CONTACT CITY WATER, AND WASTE DEPARTMENTS 48 HOURS PRIOR TO TAP. NO EXCEPTIONS.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
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Revision No.	Date	Description

STATE OF TEXAS
KYLE A. HUNTER
121984
LICENSED
PROFESSIONAL ENGINEER

Project No.:	32885.001
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Sheet Title

PLUMBING GENERAL LEGEND

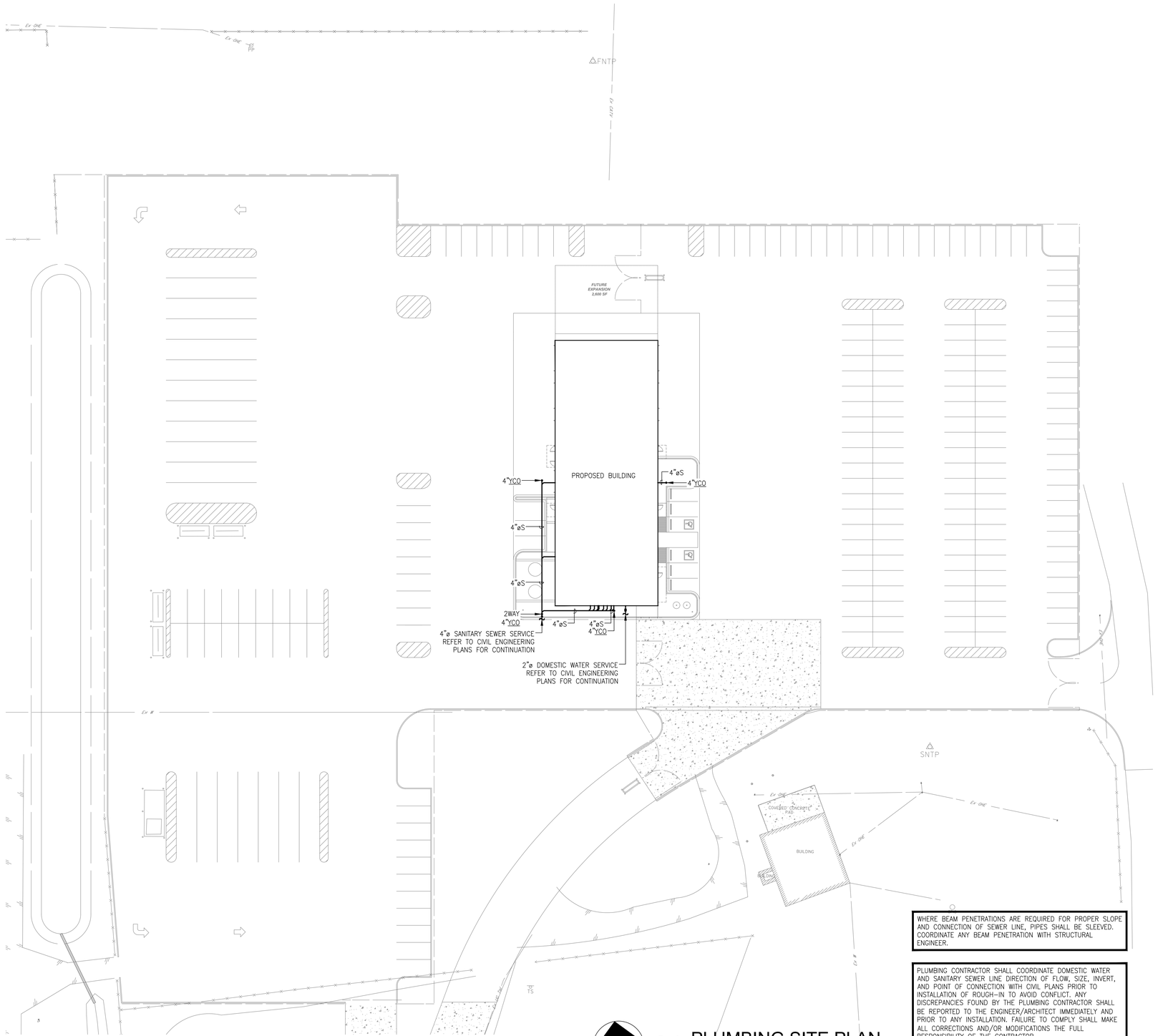
P001

Sheet Number

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GENERAL NOTES:

A. REFER TO SHEET P001 FOR PLUMBING GENERAL NOTES.



WHERE BEAM PENETRATIONS ARE REQUIRED FOR PROPER SLOPE AND CONNECTION OF SEWER LINE, PIPES SHALL BE SLEEVED. COORDINATE ANY BEAM PENETRATION WITH STRUCTURAL ENGINEER.

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH CIVIL PLANS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.

01 PLUMBING SITE PLAN

SCALE: 1"=30'

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0500
FAX (956) 664-0282
TBPE FIRM #F-312

Revision No.	Date	Description

KYLE A. HUNTER
121984
LICENSED PROFESSIONAL ENGINEER
11-06-20

Project No.:	32885.001
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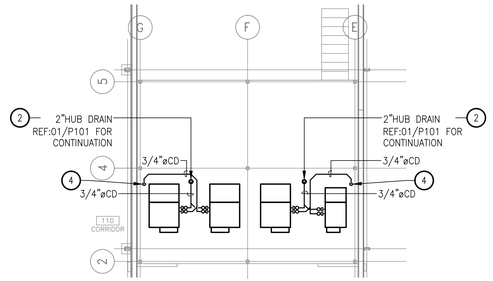
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PLUMBING SITE PLAN

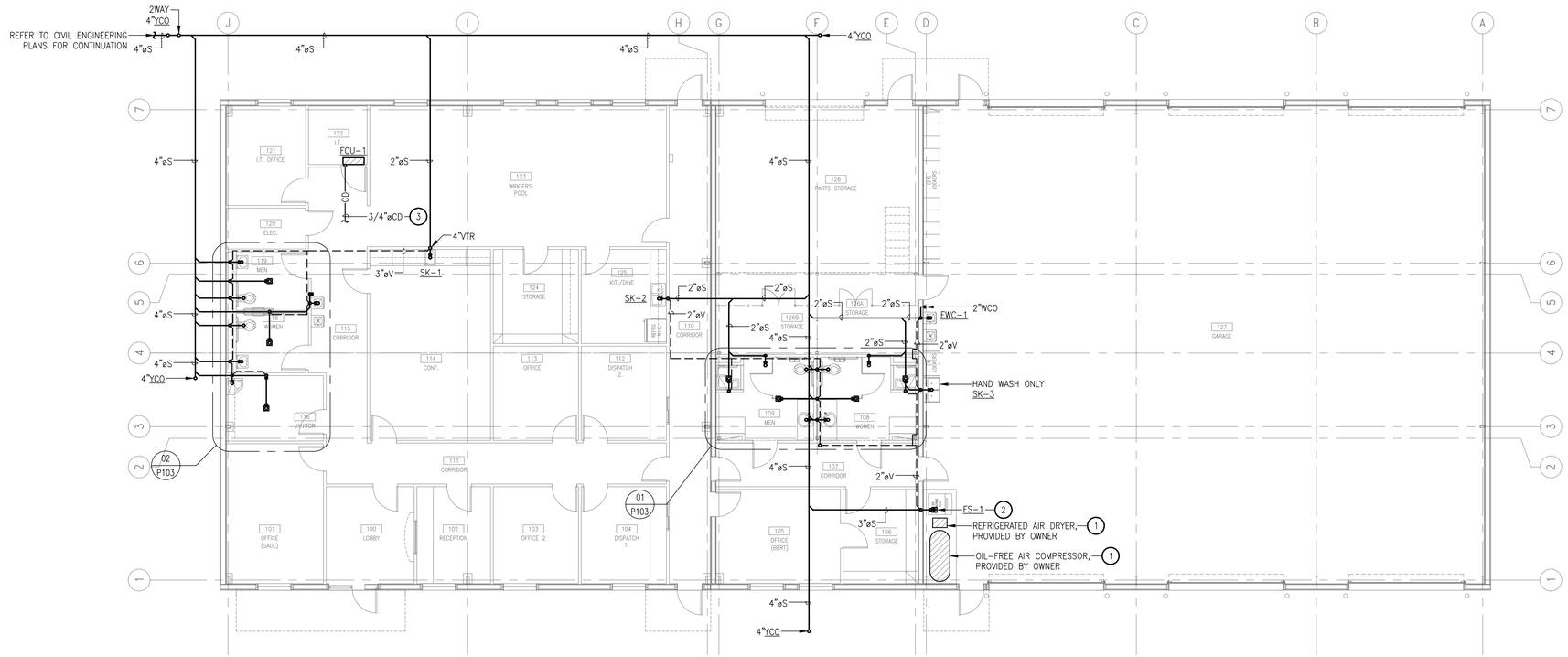
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02 PLUMBING SANITARY SEWER PLAN - MEZZANINE
SCALE: 1/8" = 1'-0"



WHERE BEAM PENETRATIONS ARE REQUIRED FOR PROPER SLOPE AND CONNECTION OF SEWER LINE, PIPES SHALL BE SLEEVED. COORDINATE ANY BEAM PENETRATION WITH STRUCTURAL ENGINEER.

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH CIVIL PLANS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.

01 PLUMBING SANITARY SEWER PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

A. REFER TO SHEET P001 FOR PLUMBING GENERAL NOTES.

B. CONTRACTOR SHALL COORDINATE ALL SHOP EQUIPMENT REQUIREMENTS AND LOCATIONS WITH OWNER PRIOR TO COMMENCING WORK.

C. HORIZONTAL SANITARY SEWER PIPING SHALL BE SLOPED 1/8 ON AN INCH PER FOOT.

KEY NOTES:

1. PLUMBING CONTRACTOR SHALL COORDINATE FLOOR SINK LOCATION WITH AIR COMPRESSOR INSTALLER FOR FINAL LOCATION OF AIR COMPRESSORS PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICTS.
2. PROVIDE PROVENT SYSTEMS PRO-SET TRAP GUARD MODEL #TG TO PREVENT P-TRAP WATER EVAPORATION.
3. PROVIDE AND INSTALL INSULATED COPPER CONDENSATE DRAIN LINE IN ATTIC SPACE. PROVIDE PIPE HANGER SUPPORTS MAXIMUM 5'-0" O.C. SPACING. SLOPE PIPING 1/8 INCH PER FOOT. ROUTE AND DROP CONDENSATE LINE EXPOSED ALONG THE WALL INTO NEAREST MOP SINK. CLAMP PIPE SECURELY TO WALL.
4. PENETRATE MEZZANINE DOWN TO CEILING SPACE BELOW. AUXILIARY CONDENSATE DRAIN LINE SHALL TERMINATE ABOVE SHOWER STALL BELOW. REFER TO DETAIL 05/P201 FOR REQUIREMENTS.

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 994-0200
FAX (956) 994-0282
TBPE FIRM #F-312

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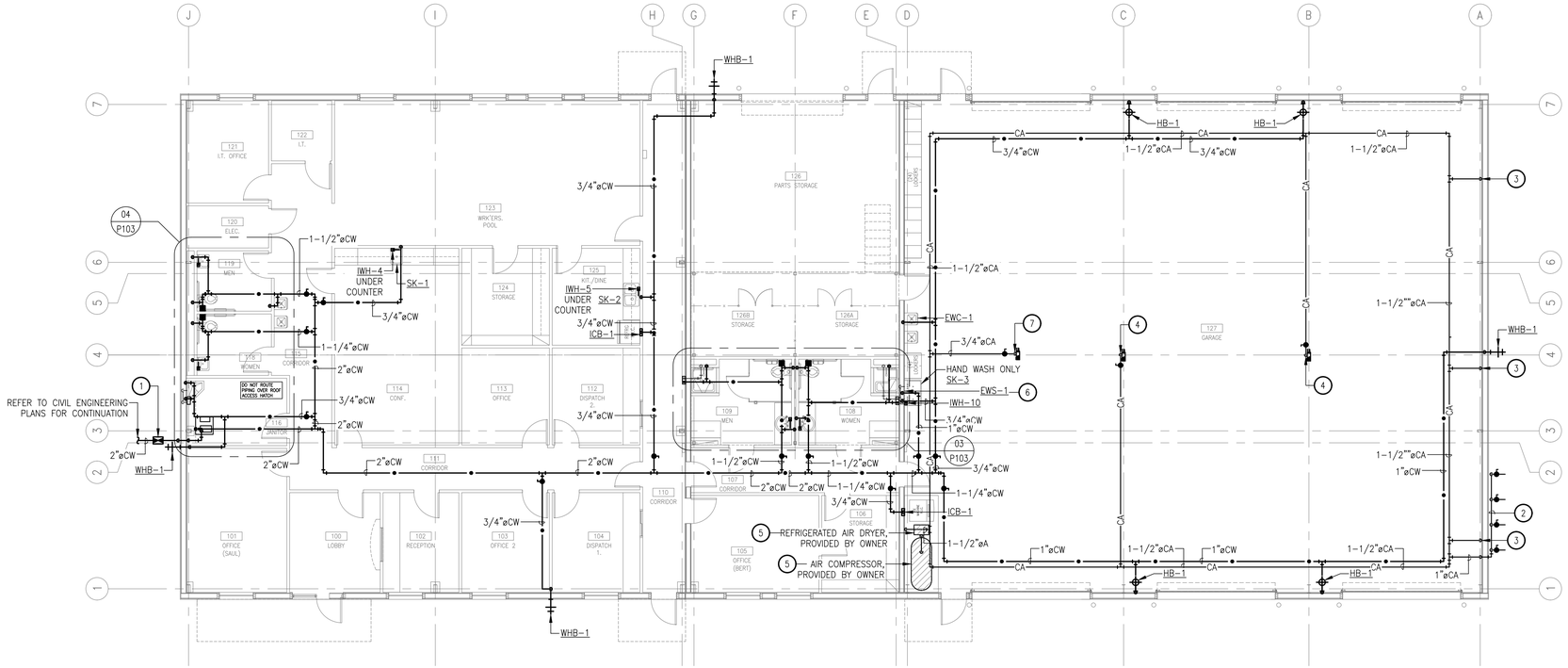
KYLE A. HUNTER
121984
LICENSED
PROFESSIONAL ENGINEER
11-6-20

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PLUMBING SANITARY SEWER PLAN

P101
Sheet Number

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WHERE BEAM PENETRATIONS ARE REQUIRED FOR PROPER SLOPE AND CONNECTION OF SEWER LINE, PIPES SHALL BE SLEEVED. COORDINATE ANY BEAM PENETRATION WITH STRUCTURAL ENGINEER.

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH CIVIL PLANS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.

01 PLUMBING DOMESTIC WATER PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

A. REFER TO SHEET P001 FOR PLUMBING GENERAL NOTES.

B. CONTRACTOR SHALL COORDINATE ALL SHOP EQUIPMENT REQUIREMENTS AND LOCATIONS WITH OWNER PRIOR TO COMMENCING WORK.

KEY NOTES:

1. SHUT OFF BALL VALVE IN CAST BOX SET FLUSH WITH FINISH GRADE.
2. ROUTE AND INSTALL COMPRESSED AIR LINE FOR LUBE OIL TANK PUMPS PROVIDED BY OTHERS. COORDINATE QUANTITY AND FINAL PUMP LOCATIONS COORDINATE WITH LUBE OIL TANK PUMPS INSTALLER PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT.
3. 3/4" AIR DROP WITH 1/2" QUICK DISCONNECT HOSE COUPLING. REFER TO AIR DROP CONNECTION DETAIL FOR REQUIREMENTS.
4. DROP AND CONNECT 3/4" COMPRESSED AIR PIPING TO HOSE REEL BANK PROVIDED BY OTHERS. COORDINATE QUANTITY AND FINAL LOCATION OF OIL/AIR HOSE REEL BANKS WITH OIL/FLUIDS PIPING INSTALLER PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT.
5. OIL FREE AIR COMPRESSOR AND AIR DRYER TO BE PROVIDED BY OWNER AND INSTALLED BY PLUMBING CONTRACTOR. COORDINATE EQUIPMENT ELECTRICAL REQUIREMENTS WITH ELECTRICAL CONTRACTOR PRIOR TO PURCHASING TO AVOID CONFLICT. ROUTE CONDENSATE LINE TO FLOOR SINK UNDER ADJACENT ICE MACHINE, REFER TO PLUMBING SANITARY SEWER PLAN FOR FLOOR SINK LOCATION.
6. INSTALL EMERGENCY PULL DOWN EYEWASH CENTERED ON SINK BACK SPLASH. MOUNT THE TWO BOTTLE EYE WASH STATION ON WALL ABOVE SINK.
7. DROP AND CONNECT 3/4" COMPRESSED AIR PIPING TO TIRE MACHINE HOSE REEL PROVIDED BY OTHERS. COORDINATE HOSE REEL FINAL LOCATION WITH OIL/FLUIDS PIPING INSTALLER PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT.

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 994-0200
FAX (956) 994-0282
TBPE FIRM #F-312

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KYLE A. HUNTER
121984
LICENSED PROFESSIONAL ENGINEER
11-06-2020

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PLUMBING DOMESTIC WATER PLAN

P102
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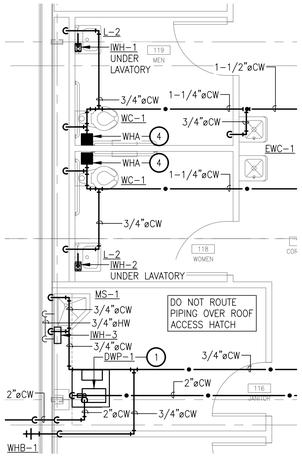
GENERAL NOTES:

A. REFER TO SHEET P001 FOR PLUMBING GENERAL NOTES.

B. HORIZONTAL SANITARY SEWER PIPING SHALL BE SLOPED 1/8 ON AN INCH PER FOOT.

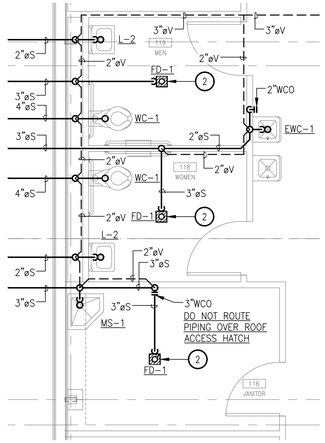
KEY NOTES: (i)

1. PROVIDE AND INSTALL PACKAGE BOOSTER PUMP WITH BLADDER TANK AS PER MANUFACTURER RECOMMENDATIONS. INSTALL WITH BYPASS PIPING AND SHUTOFF VALVE INDICATED ON PIPING DIAGRAM. REFER TO DETAIL 07 ON SHEET P201 FOR PIPING DIAGRAM.
2. PROVIDE PROVENT SYSTEMS PRO-SET TRAP GUARD MODEL #TG TO PREVENT P-TRAP WATER EVAPORATION.
3. PROVIDE AND INSTALL INSULATED COPPER CONDENSATE DRAIN LINE IN ATTIC SPACE. PROVIDE PIPE HANGER SUPPORTS MAXIMUM 5'-0" O.C. SPACING. SLOPE PIPING 1/8 INCH PER FOOT. ROUTE AND DROP CONDENSATE LINE EXPOSED ALONG THE WALL INTO NEAREST MOP SINK. CLAMP PIPE SECURELY TO WALL.
4. WATER HAMMER ARRESTOR ABOVE CEILING. WHERE INACCESSIBLE PROVIDE AND INSTALL 12"X12" HINGED 16 GAUGE STEEL ACCESS PANEL WITH LOCKABLE KEYED DOOR. PRIME COATED WITH RUST INHIBITIVE ELECTROSTATIC POWDER, BAKED GREY ENAMEL AND SHALL BE PAINTED TO MATCH SURROUNDING AREAS. COORDINATE LOCATION TO AVOID CONFLICTS WITH LIGHT FIXTURES AND MECHANICAL EQUIPMENT ON CEILING.
5. INSTANTANEOUS WATER HEATER ABOVE CEILING. PROVIDE AND INSTALL 24"X24" HINGED 16 GAUGE STEEL ACCESS PANEL WITH LOCKABLE KEYED DOOR. PRIME COATED WITH RUST INHIBITIVE ELECTROSTATIC POWDER, BAKED GREY ENAMEL AND SHALL BE PAINTED TO MATCH SURROUNDING AREAS. COORDINATE LOCATION TO AVOID CONFLICTS WITH LIGHT FIXTURES AND MECHANICAL EQUIPMENT ON CEILING.
6. 2" HUB DRAIN LOCATED ABOVE CEILING AND STUBBING UP TO MEZZANINE. REFER TO VIEW 02 ON SHEET P101 FOR CONTINUATION.



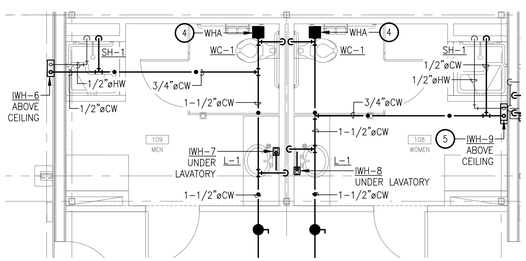
04 PLUMBING ENLARGED DOMESTIC WATER PLAN - ROOMS 116 117 118 & 119

SCALE: 1/4" = 1'-0"



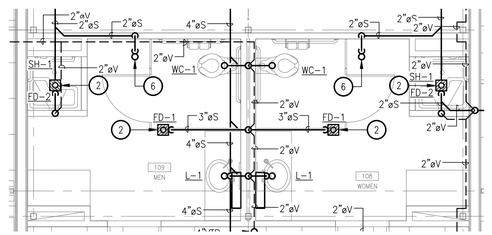
02 PLUMBING ENLARGED SANITARY SEWER PLAN - ROOMS 116 117 118 & 119

SCALE: 1/4" = 1'-0"



03 PLUMBING ENLARGED DOMESTIC WATER PLAN - ROOMS 108 & 109

SCALE: 1/4" = 1'-0"



01 PLUMBING ENLARGED SANITARY SEWER PLAN - ROOMS 108 & 109

SCALE: 1/4" = 1'-0"

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
500 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
PHONE (956) 664-0202
FAX (956) 664-0282
TBPE FIRM #F-312

Revision No.	Date	Description

STATE OF TEXAS
KYLE A. HUNTER
121984
LICENSED
PROFESSIONAL ENGINEER

Project No.:	32885.001
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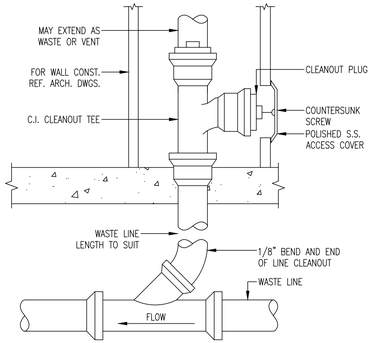
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PLUMBING ENLARGED PLANS

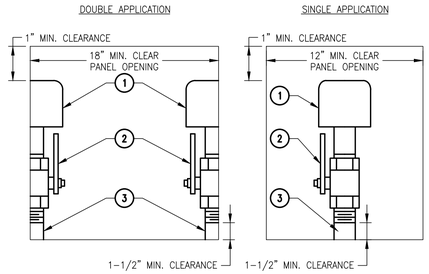
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09 WALL CLEANOUT DETAIL
N.T.S.

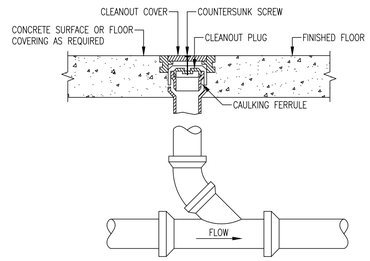


NOTE:
PROVIDE REDUCER IF REQUIRED BETWEEN VALVE AND WATER HAMMER ARRESTOR.

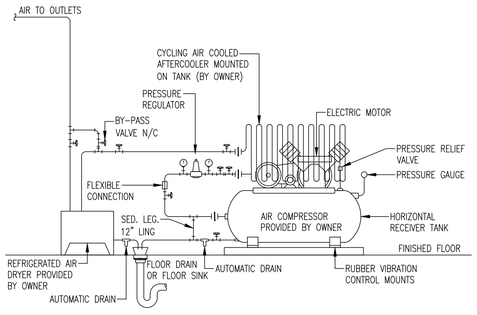
KEY NOTES:

1. WATER HAMMER ARRESTOR
2. BALL VALVE, SAME NOMINAL SIZE AS PIPE BRANCH IN CHASE. OPENING IN BALL VALVE TO MATCH PIPE I.D.
3. PIPE SAME SIZE AS BRANCH IN CHASE TO WHICH IT IS ATTACHED.

06 TYPICAL WATER HAMMER PANEL INSTALLATION
SCALE: N.T.S.

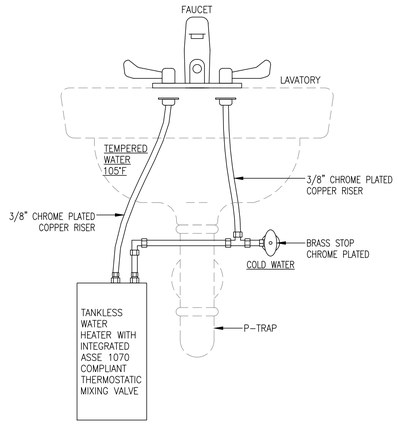


03 INTERIOR CLEAOUT DETAIL
SCALE: N.T.S.

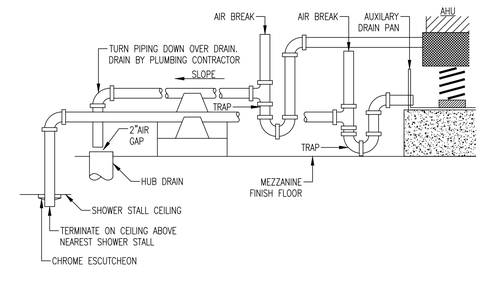


NOTE:
- PIPING AND CONNECTIONS SHOWN IS FOR STANDARD INSTALLATION BUT MAY VARY FOR FURNISHED EQUIPMENT AND SHOULD BE ADJUSTED ACCORDINGLY.
- REFER TO MANUFACTURER'S RECOMMENDATIONS REGARDING PIPING AND INSTALLATION.

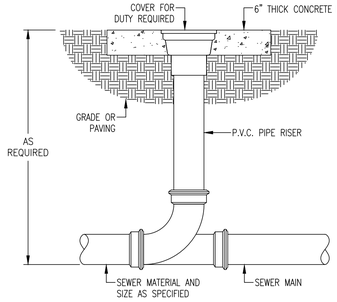
FOR REFERENCE ONLY - OWNER PROVIDED - 11 AIR COMPRESSOR PIPING DETAIL
SCALE: N.T.S.



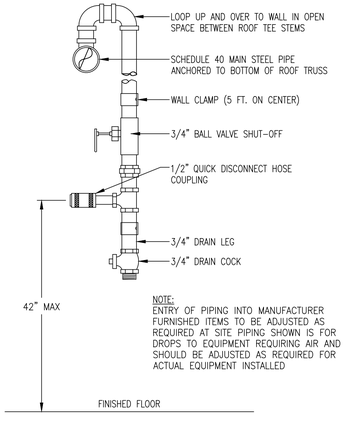
08 TANKLESS WATER HEATER MOUNTING DETAIL
SCALE: N.T.S.



05 CONDENSATE DRAIN DETAIL
N.T.S.

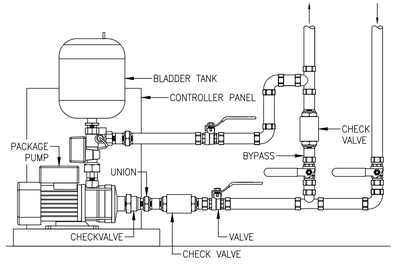


02 EXTERIOR CLEANOUT DETAIL
SCALE: N.T.S.

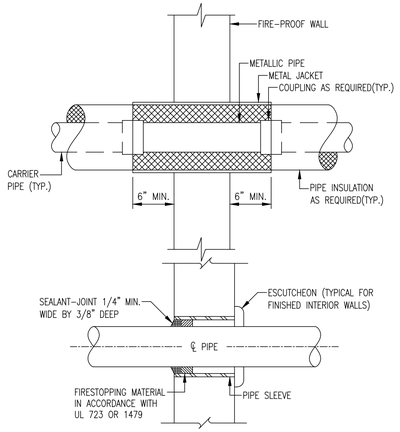


NOTE:
ENTRY OF PIPING INTO MANUFACTURER FURNISHED ITEMS TO BE ADJUSTED AS REQUIRED AT SITE PIPING SHOWN IS FOR DROPS TO EQUIPMENT REQUIRING AIR AND SHOULD BE ADJUSTED AS REQUIRED FOR ACTUAL EQUIPMENT INSTALLED

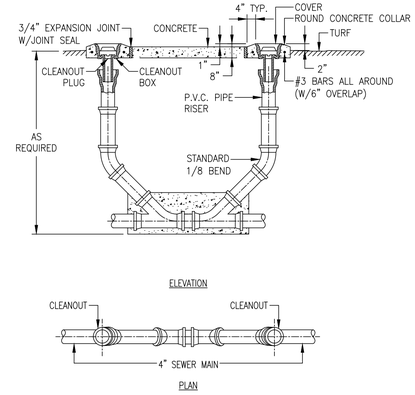
10 AIR DROP CONNECTION DETAIL
SCALE: N.T.S.



07 DOMESTIC WATER BOOSTER PIPING DIAGRAM
SCALE: N.T.S.



04 TYP. FIRE PROOF & WALL PENETRATION
SCALE: N.T.S.



01 TYPICAL EXTERIOR TWO WAY CLEANOUT DETAIL
SCALE: N.T.S.

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 682-0202
FAX (956) 664-0282
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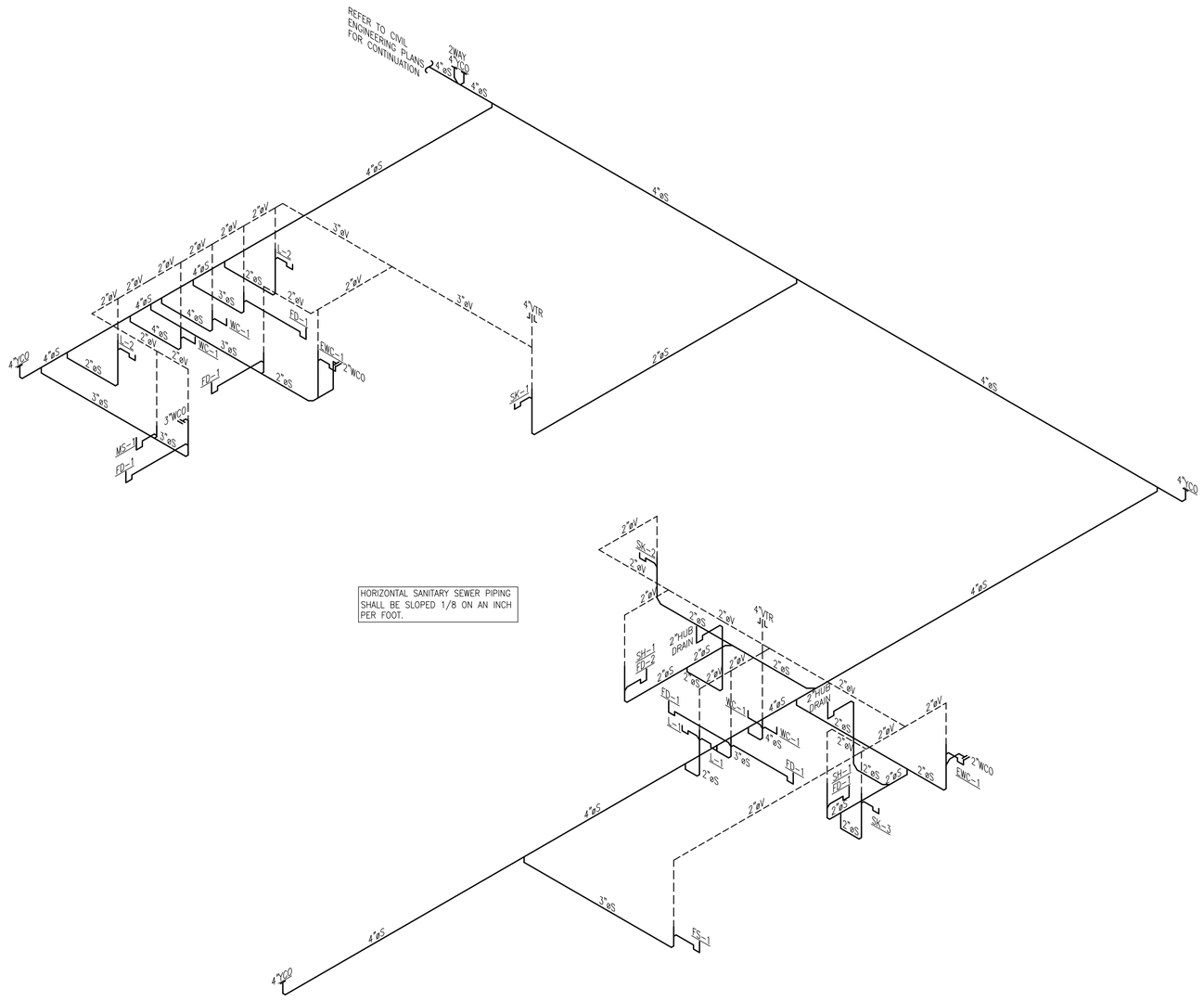
KYLE A. HUNTER
121984
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

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P201
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HORIZONTAL SANITARY SEWER PIPING SHALL BE SLOPED 1/8 ON AN INCH PER FOOT.

01 PLUMBING RISER SCHEMATIC DIAGRAM - SANITARY SEWER
N.T.S.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

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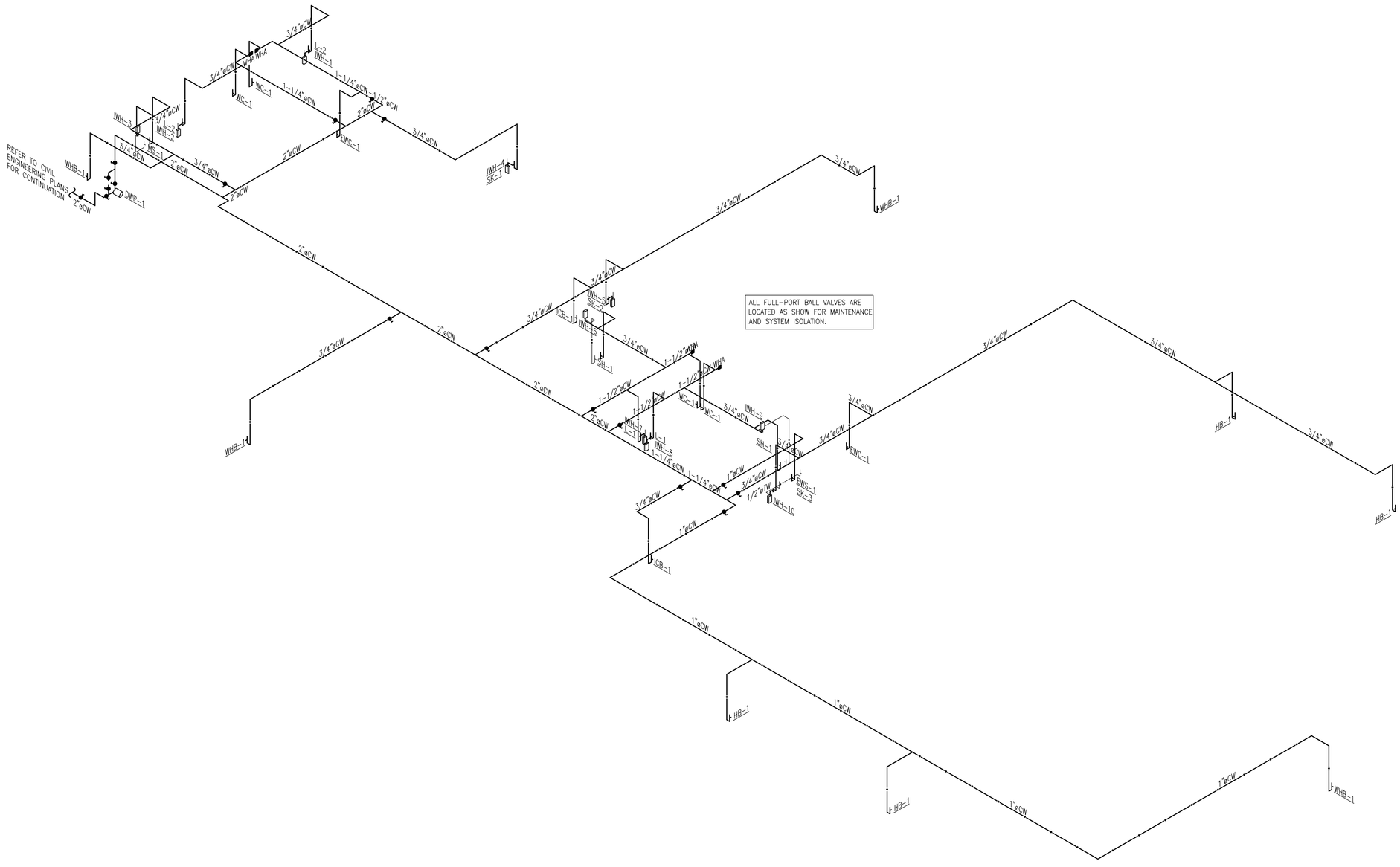
STATE OF TEXAS
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121984
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Checked By:	KH
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PLUMBING RISER SCHEMATIC DIAGRAM - SANITARY SEWER

P202
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01 PLUMBING RISER SCHEMATIC DIAGRAM - DOMESTIC WATER
N.T.S.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

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5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
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121984
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PLUMBING RISER SCHEMATIC DIAGRAM - DOMESTIC WATER

P203
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BOOSTER PUMP SCHEDULE

MARK	LOCATION	SELECTION BASED ON		GPM	FEET HEAD	HP	VOLTAGE/PHASE/HZ	NOTES
		MFR	MODEL					
DWP-1	116 JANITOR	BELL & GOSSET	SIMPLEX BOOSTER 1B30AB-VS	50	40	3	208/3/60	ALL

NOTES:
1. PACKAGE BOOSTER PUMP SYSTEM COMPLETE WITH INTEGRATED VFD.
2. PROVIDE BLADDER TANK AS PER MANUFACTURER RECOMMENDATIONS.

WATER HAMMER ARRESTOR SIZING TABLE

P.D.I. SYMBOLS	A	B	C	D	E	F	NOTES
FIXTURE UNIT CAPACITY	1-11	12-32	33-60	61-113	114-154	155-330	ALL

NOTES:
1. IF WATER PRESSURE EXCEEDS 65 PSI USE THE NEXT LARGER SIZE
2. ALL WATER HAMMER ARRESTER SHALL HAVE ACCESS PANEL FOR MAINTENANCE.

PLUMBING SCHEDULE

MARK	FIXTURE TYPE	CONNECTION SIZE				DESCRIPTION
		SS	V	CW	HW	
FD-1	GENERAL DUTY FLOOR DRAIN	3"	2"	–	–	LACQUERED CAST IRON FLOOR DRAIN EQUAL TO ZURN MODEL #Z415B. COMPLETE WITH "TYPE B" NICKEL BRONZE STRAINER AND PROVENT SYSTEMS PRO-SET TRAP GUARD MODEL #TG TO PREVENT P-TRAP WATER EVAPORATION.
FD-2	SHOWER DRAIN	2"	2"	–	–	LACQUERED CAST IRON FLOOR DRAIN EQUAL TO ZURN MODEL #Z415B. COMPLETE WITH "TYPE B" NICKEL BRONZE STRAINER AND PROVENT SYSTEMS PRO-SET TRAP GUARD MODEL #TG TO PREVENT P-TRAP WATER EVAPORATION.
FS-1	FLOOR SINK	3"	2"	1/2"	–	ZURN MODEL #Z1900-2 PROCELAIN ENAMELED CAST IRON FLOOR SINK. 12"X12"X6" WITH ANTI-SPLASH INTERIOR BOTTOM DOME STRAINER, PORCELAIN ENAMELED CAST IRON HALF GRATE AND TRAP PRIMER CONNECTION. PROVIDE PROVENT SYSTEMS PRO-SET TRAP GUARD MODEL #TG TO PREVENT P-TRAP WATER EVAPORATION.

NOTE: REFER TO ARCHITECTURAL PLANS FOR MOUNTING HEIGHTS.

PLUMBING PIPING MATERIALS SCHEDULE

SERVICE	PIPE	FITTINGS	JOINTS	HANGERS	INSULATION			NOTES
					CONDITIONED SPACES	UNCONDITIONED SPACE	OUTDOORS	
DOMESTIC COLD WATER BELOW GRADE	TYPE K COPPER SOFT	SOLDER JOINT	BRAZED	NONE	–	–	–	
DOMESTIC COLD WATER ABOVE GRADE	TYPE L COPPER HARD	SOLDER JOINT	SOCKET WELD	COPPER PLATED	1/2" MINERAL FIBER	1/2" MINERAL FIBER	HEAT TRACE	
DOMESTIC HOT WATER ABOVE GRADE	TYPE L COPPER HARD	SOLDER JOINT	SOCKET WELD	COPPER PLATED	1" MINERAL FIBER	1-1/2" MINERAL FIBER	–	
SANITARY WASTE & VENT BELOW GRADE	PVC	PVC	SOLVENT WELD	NONE			–	
SANITARY WASTE & VENT ABOVE GRADE	PVC	PVC	SOLVENT WELD	NONE	FIRE WRAP IN PLENUM	–	–	
COMPRESSED AIR PIPING ABOVE GRADE	BLACK STEEL PIPE	THREADED	THREADED	NONE				

NOTES:

INSTANTANEOUS TANKLESS WATER HEATER SCHEDULE

MARK	LOCATION	SELECTION BASED ON		VOLTAGE /PHASE	WATTS INPUT	TEMP. RISE @ 0.5GMP FLOW	NOTES
		MFR	MODEL				
IWH-1	119 MEN	EeMAX	AM005240T	208/1	3600	49°F RISE	1,3
IWH-2	118 WOMEN	EeMAX	AM005240T	208/1	3600	49°F RISE	1,3
IWH-3	116 JANITOR	EeMAX	EX144T2	208/1	11200	–	4
IWH-4	114 CONFERENCE	EeMAX	AM005240T	208/1	3600	49°F RISE	1,2
IWH-5	125 KIT/DINE	EeMAX	AM005240T	208/1	3600	49°F RISE	1,2
IWH-6	110 COORIDOR	EeMAX	EX023240T2	208/1	17300	–	2
IWH-7	109 MEN	EeMAX	AM005240T	208/1	3600	49°F RISE	1,3
IWH-8	108 WOMEN	EeMAX	AM005240T	208/1	3600	49°F RISE	1,3
IWH-9	108 WOMEN	EeMAX	EX023240T2	208/1	17300	–	2
IWH-10	127 GARAGE	EeMAX	AM010240T	208/1	7500	–	1,3

NOTES:
1. UNIT SHALL MEET ASSE 1070 REQUIREMENTS.
2. SET TEMPERATURE OUTLET TO BE 120°F.
3. SET TEMPERATURE OUTLET TO BE 98.6°F.
4. SET TEMPERATURE OUTLET TO BE 140°F.

PLUMBING SCHEDULE

MARK	FIXTURE TYPE	CONNECTION SIZE				DESCRIPTION
		SS	V	CW	HW	
WC-1	WATER CLOSET FLOOR MOUNTED (HANDICAP)	4"	2"	1"	–	VITREOUS CHINA, ELONGATED RIM, SIPHON JET ACTION, 1.28GPF, ADA COMPLIANT WALL MOUNTED WATER CLOSET EQUAL TO AMERICAN STANDARD AFWALL MODEL #3351.101. COMPLETE WITH 1.28GPF, BATTERY POWERED, SENSOR OPERATED EXPOSED FLUSH VALVE MOEN MODEL #8311 WITH MECHANICAL OVERRIDE AND AMERICAN STANDARD #5901.100 OPEN FRONT SEAT LESS COVER AND APPROVED CARRIER SYSTEM.
L-1	LAVATORY COUTERTOP (HANDICAP)	2"	2"	–	1/2"TW	VITREOUS CHINA, 20-3/8"X 17-3/8", SELF RIMMING, 4" CENTERS, OVAL LAVATORY EQUAL TO AMERICAN STANDARD "AQUALYN" MODEL #0476.028. COMPLETE WITH ADA COMPLIANT CHROME PLATED CAST BRASS DECK MOUNTED FAUCET, 0.35GPM, BATTERY POWERED, COVER PLATE 4" CENTERS EQUAL TO SLOAN FAUCET MODEL #EBF-650-BAT-TEE-SF-0.5GPM-MLM-IR-BT-FC. PROVIDE OFFSET TAILPIECE, GRID STRAINER, ANGLE STOPS, SUPPLY-LOOSE KEY AND CHROME PLATED P-TRAP WITH CLEANOUT PROTECTIVE COVERING.
L-2	LAVATORY WALL-MOUNTED (HANDICAP)	2"	2"	–	1/2"TW	ITREOUS CHINA, WALL MOUNTED, FRONT OVERFLOW, 3 FAUCET HOLES ON 4" CENTERS, LAVATORY EQUAL TO AMERICAN STANDARD LUCERNE MODEL #0355.012. COMPLETE WITH ADA COMPLIANT CHROME PLATED CAST BRASS DECK MOUNTED FAUCET, 0.35GPM, BATTERY POWERED, COVER PLATE 4" CENTERS EQUAL TO ZURN FAUCET MODEL #EBF-650-BAT-TEE-SF-0.5GPM-MLM-IR-BT-FC. PROVIDE OFFSET TAILPIECE, GRID STRAINER, ANGLE STOPS, SUPPLY-LOOSE KEY, CHROME PLATED P- TRAP WITH CLEANOUT PROTECTIVE COVERING AND APPROVED CARRIER SYSTEM.
SK-1	SINK COUNTERTOP (HANDICAP)	2"	2"	1/2"	1/2"	SINGLE COMPARTMENT, STAINLESS STEEL SINK EQUAL TO ELKAY MODEL #LRAD-1916-50-3. SELF RIMMING, 19-1/2"X16"X5", 3 HOLES ON 4"CENTERS, 18 GAUGE, UNDERCOATED. COMPLETE WITH AMERICAN STANDARD MODEL #6409.170-V05, 8" GOOSENECK FAUCET, 0.5GPM AERATOR, WRIST BLADE HANDLES, CONCEALED MOUNT, #LK-35 STRAINER WITH BASKET, OFFSET P-TRAP AND PROTECTIVE COVERS.
SK-2	SINK COUNTERTOP (HANDICAP)	2"	2"	1/2"	1/2"	DOUBLE COMPARTMENT, STAINLESS STEEL SINK EQUAL TO ELKAY MODEL #LRAD-3321-60-3. SELF RIMMING, 32"X21"X6", 3 HOLE ON 4" CENTERS, 18 GAUGE, UNDERCOATED. COMPLETE WITH AMERICAN STANDARD MODEL #6409.170-V05 8" GOOSENECK, 0.5GPM AERATOR, WRIST BLADE HANDLES, CONCEALED MOUNT FAUCET AND ELKAY MODEL #LK-35 STRAINER WITH BASKET.
SK-3	HAND WASH SINK WALL MOUNTED (HANDICAP)	2"	2"	–	1/2"TW	STAINLESS STEEL #14 GAUGE, TYPE 304, TWO STATION WASH SINK EQUAL TO ADVANCE TABCO MODEL #FS-WM-40KV, 40 INCHES LONG, FULL LENGTH 8-1/2" HIGH BACKSPLASH. FURNISHED WITH WALL HANGERS AND STAINLESS STEEL SUPPORT BRACKETS. COMPLETE WITH THREE KNEE OPERATED CHROME PLATED BACKSPLASH MOUNTED 8"O.C. GOOSENECK FAUCETS WITH BLADE HANDLES EQUAL TO ADVANCE TABCO MODEL #K-121 AND ADVANCE TABCO KNEE VALVE(S) MODEL #7-PS-32, STAINLESS STEEL PERFORATED GRID STRAINER, WALL MOUNTED SOAP DISPENSER ADVANCE TABCO MODEL #K-13, STAINLESS STEEL TAILPIECE AND PROTECTIVE COVERING.
EWS-1	EMERGENCY EYE WASH	–	–	1/2"	–	WALL-MOUNT SWING-DOWN EYE/FACE WASH UNIT EQUAL TO BRADLEY MODEL #S19-270JW. CHROME-PLATED BRASS SPRAYHEAD ASSEMBLY WITH TWIN SOFT-FLOW EYEWASH HEADS AND PROTECTIVE SPRAYHEAD COVERS. THE INTEGRAL FLOW CONTROL ASSURES SAFE, STEADY FLOW UNDER VARYING WATER SUPPLY CONDITIONS FROM 30-90 PSI. COMPLETE WITH SECONDARY WALL-MOUNTED TWO BOTTLE EYE WASH STATION 64 OZ CAPACITY EQUIVALENT TO ULINE MODEL #H-1174.
SH-1	SHOWER (HANDICAP)	2"	2"	1/2"	1/2"	BUILT-IN BARRIER FREE HAND HELD SHOWER EQUAL TO BRADLEY MODEL #1C-EF-ST-S115-LBJ-A36-DV-RSD. PRESSURE BALANCING VALVE, STANDARD SHOWER HEAD, 1.5GPM, LOCKABLE BALL JOINT, 60"FLEXIBLE HOSE, ADA GRAB BAR, VACUUM BREAKER, IN-WALL DIVERTER VALVE, RECESSED SOAP DISH, FOLD-UP SEAT AND ALL NECESSARY HARDWARE.
MS-1	MOP SINK FLOOR MOUTNED	2"	2"	3/4"	3/4"	FLOOR-MOUNTED TERRAZZO SERVICE SINK EQUAL TO STERN-WILLIAMS MODEL #HL-1800-BP. 24"X24"X12" WITH 6" DROP FRONT WITH STAINLESS STEEL CAP. COMPLETE WITH STAINLESS STEEL BACK PANELS MODEL #BP, SERVICE SINK FAUCET MODEL #T-10-VB WITH 8" CENTERS, PAIL HOOK, WALL BRACKET, VACUUM BREAKER SPOUT, AND LEVER HANDLES. MOP HANGER MODEL #T-40 AND 5'-0" REINFORCED RUBBER HOSE MODEL #T-35.
EWC-1	BI-LEVEL WATER COOLER (HANDICAP)	2"	2"	1/2"	–	BI-LEVEL HANDS FREE ACTIVATION SELF-CONTAINED WALL HUNG, FILTERED REFRIGERATED WATER COOLER WITH BOTTLE FILLING STATION EQUAL TO ELKAY #LZOOTLBWSLK. HANDS FREE ACTIVATION CONTROLS, STAINLESS STEEL BASIN AND STAINLESS STEEL FINISH. FLEX-GUARD BUBBLER CAPABLE OF DELIVERING 8.0GPH OF 50°F WATER WITH 80°F INLET WATER AND 90°F ROOM TEMPERATURE. COMPLETE WITH APPROVED CARRIER SYSTEM.
ICB	ICE CONNECTION BOX	–	–	1/2"	–	LEAD FREE ICE CONNECTION BOX EQUAL TO GUY GRAY MODEL #BIM875.
HB	HOSE BIB	–	–	3/4"	–	WALL MOUNTED FAUCET EQUAL TO WOODFORD MODEL #26-P CHROME FINISH, WITH BACK FLOW PREVENTER, AND LOOSE TEE KEY.
WHB-1	WALL HYDRANT BIB	–	–	3/4"	–	ZURN MODEL #Z-1300 ENCASED ANTI SIPHON, NON FREEZE, AUTOMATIC DRAINING WALL HYDRANT FOR FLUSH WALL INSTALLATION COMPLETE WITH BACK FLOW PREVENTER, CLOSURE VALVE, AND HINGED, KEY LOCKED COVER STAMPED "WATER".

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HIDALGO COUNTY PRECINCT ONE

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0282
FAX (956) 664-0282
TBPE FIRM #F-312

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P301

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ELECTRICAL GENERAL LEGEND

ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS. SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION	MTG. HT. UNO (SEE NOTE 1)
LIGHTING		
	2'x4' LAY-IN LUMINARY HATCHING = WITH EMERGENCY BATTERY PACK	REFER TO ARCH. CLG. PLAN
	2'x2' LAY-IN LUMINARY HATCHING = WITH EMERGENCY BATTERY PACK	REFER TO ARCH. CLG. PLAN
	STRIP LIGHT HATCHING = WITH EMERGENCY BATTERY PACK	REFER TO ARCH. CLG. PLAN
	SUSPENDED LINEAR LUMINARY	REFER TO ARCH. CLG. PLAN
	DOWNLIGHT HATCHING = WITH EMERGENCY BATTERY PACK	REFER TO ARCH. CLG. PLAN
	WALLPACK HATCHING = WITH EMERGENCY BATTERY PACK	REFER TO ARCH. CLG. PLAN
	EMERGENCY FIXTURE	9'-0" AFF U.N.O.
	POLE MOUNTED FIXTURE	REFER TO LUMINARIES SCHEDULE
	EXIT LIGHT, CEILING OR WALL MOUNTED - SHADING INDICATING SINGLE OR DOUBLE FACE; DIRECTIONAL ARROWS AS INDICATED	REFER TO ARCH. CLG. PLAN
$	SINGLE POLE SWITCH	48" AFF
$3 / $4	3-WAY/4-WAY SWITCH	48" AFF
$(XX)	DIGITAL SWITCH - X=SWITCH ID, XX=nLIGHT SWITCH TYPE	-
$1	SINGLE POLE SWITCH BASIS OF DESIGN: nLIGHT #NPODM-XX	48" AFF
$1D	SINGLE POLE DIMMER SWITCH BASIS OF DESIGN: nLIGHT #NPODM-DX-XX	48" AFF
$2D	2-POLE DIMMER SWITCH BASIS OF DESIGN: nLIGHT #NPODM-2P-DX-XX	48" AFF
$4D	4-POLE DIMMER SWITCH BASIS OF DESIGN: nLIGHT #NPODM-4P-DX-XX	48" AFF
$PD	OCCUPANCY SENSOR WALL SWITCH BASIS OF DESIGN: nLIGHT #WSX-XX	48" AFF
CS	CEILING MOUNT OCCUPANCY SENSOR - (DUAL TECHNOLOGY) BASIS OF DESIGN: nLIGHT #NCM-PDT-9	-
CH	CEILING MOUNT HIGH BAY OCCUPANCY SENSOR BASIS OF DESIGN: nLIGHT #NCM-6	-
CH L	CEILING MOUNT HIGH BAY LINE VOLTAGE OCCUPANCY SENSOR BASIS OF DESIGN: SensorSwitch #CMR-6	-
DS	CEILING MOUNT DAYLIGHT SENSOR BASIS OF DESIGN: nLIGHT #NCM-ADCX	-
DS L	CEILING MOUNT LINE VOLTAGE DAYLIGHT SENSOR BASIS OF DESIGN: SensorSwitch #CMR-PC-ADC	-
WS	CORNER MOUNT OCCUPANCY SENSOR - (DUAL TECHNOLOGY) BASIS OF DESIGN: nLIGHT #NWV-PDT-16-KIT	-
PD	POWER/RELAY PACK BASIS OF DESIGN: nLIGHT #NPP16-D-EFP	-
N	LIGHTING SYSTEM CONTROLLER BASIS OF DESIGN: nLIGHT #NECY-MVOLT-ENC-GFXK	-
BG	BRIDGE BASIS OF DESIGN: nLIGHT #NBRG-8-KIT	-
NK	PHOTOCELL BASIS OF DESIGN: nLIGHT #NIO-PC-KIT	-
SECURITY SYSTEM		
CR	CARD READER - ROUGH-IN ONLY	-
D	DOOR CONTACT - ROUGH-IN ONLY	-
DH	DOOR HOLDER - ROUGH-IN ONLY	-
DM	DOOR MONITOR - ROUGH-IN ONLY	-
G	GLASS BREAK SENSOR - ROUGH-IN ONLY	-
K	KEY PAD - ROUGH-IN ONLY	-
M	MOTION DETECTOR - ROUGH-IN ONLY	-
RX	REQUEST-TO-EXIT BUTTON - ROUGH-IN ONLY	-
#	CAMERA, WALL MOUNT - ROUGH-IN ONLY	-
#	CAMERA, CEILING MOUNT - ROUGH-IN ONLY	-

SYMBOL	DESCRIPTION	MTG. HT. UNO (SEE NOTE 1)
POWER		
	SINGLE RECEPTACLE - 20A/125V/1P/3W/G NEMA 5-20R	15" AFF
	DUPLEX RECEPTACLE - 20A/125V/1P/3W/G NEMA 5-20R	15" AFF
30A	220 RECEPTACLE - 250V/2P/3W/G (RATING AS INDICATED)	15" AFF
WP	DUPLEX RCPT. GFI/WATER PROOF - 20A/125V/1P/3W/G NEMA 5-20R	15" AFF
	QUADRAPLEX RECEPTACLE (TWO DUPLEX RCPTS. UNDER ONE COVERPLATE)	15" AFF
	ISOLATED GROUND QUADRAPLEX RECEPTACLE (TWO DUPLEX RCPTS. UNDER ONE COVERPLATE)	15" AFF
	ISOLATED GROUND DUPLEX RECEPTACLE - 20A/125V NEMA 5-20R	15" AFF
E	DUPLEX RECEPTACLE ON EMERGENCY CIRCUIT	15" AFF
	FLOOR MOUNTED DUPLEX RECEPTACLE - FLUSH MOUNTED UNO. FLOOR BOX TYPE WALKER LEGRAND RFB4 SERIES	-
IG	ISOLATED GROUND FLOOR MOUNTED DUPLEX RECEPTACLE FLUSH MOUNTED UNO	-
	DUPLEX RCPT. SPLIT-WIRED - 20A/125V/1P/3W/G NEMA 5-20R	15" AFF
	SPECIAL PURPOSE RECEPTACLE (NEMA NO. OR RATING AS INDICATED)	15" AFF
J J	JUNCTION BOX - SIZE & MOUNTING AS REQUIRED	15" AFF
	MULTIOUTLET ASSEMBLY - LENGTH AND OUTLET SPACING AS INDICATED	-
30/-/3	DISCONNECT SWITCH - 30/-/3 INDICATES 30A, 3-POLE, NONFUSED; 30/30/3 INDICATES 30A, 3-POLE, 30A FUSE	AS REQD.
30/3	CIRCUIT BREAKER DISCONNECT SWITCH - THERMAL MAGNETIC CB IN NEMA 1 ENCL; AMPS/POLES AS INDICATED	-
30/30/3	DISCONNECT SWITCH - 30/30/3 INDICATES 30A, 3-POLE, 30A FUSE	AS REQD.
2	MOTOR STARTER FVNR UNO; NUMBER INDICATES NEMA SIZE	AS REQD.
2	COMBINATION MOTOR CONTROLLER/DISCONNECT SWITCH	AS REQD.
	PANELBOARD	AS REQD.
	TRANSFORMER	-
	MOTOR	-
	SINGLE LINE CONTINUATION	-
	CIRCUIT HOME RUN TO PANELBOARD (2 #12, 1 #12G, 3/4"C. 20A/1P CB UNO)	-
X,X,X	THREE SINGLE POLE DEVICE CIRCUIT NUMBERS	-
X/X/X	MULTI-POLE DEVICE CIRCUIT NUMBERS	-
LINETYPES		
EX OHE	EXISTING OVERHEAD ELECTRICAL POWER LINE	
NUEP	NEW UNDERGROUND ELECTRICAL PRIMARY LINE	
	UNDERGROUND ELECTRICAL	
	LIGHTING CIRCUIT	
	CONDUIT RISE / STUB UP	
	CONDUIT DROP / STUB DOWN	
	CONDUIT CAP	
	CONDUIT CONTINUATION	

SYMBOL	DESCRIPTION	MTG. HT. UNO (SEE NOTE 1)
FIRE ALARM		
F	FIRE ALARM PULL STATION - ROUGH-IN ONLY	-
F	FIRE ALARM AUDIBLE/VISUAL SIGNAL - ROUGH-IN ONLY	48" AFF
F	FIRE ALARM AUDIBLE SIGNAL - ROUGH-IN ONLY	80" AFF
F	FIRE ALARM VISUAL SIGNAL - ROUGH-IN ONLY	80" AFF
FS	FIRE ALARM SPRINKLER FLOW SWITCH - ROUGH-IN ONLY	80" AFF
TS	FIRE ALARM SPRINKLER TAMPER SWITCH - ROUGH-IN ONLY	-
R	SPRINKLER SYSTEM REGULATOR RELAY	-
S	FIRE ALARM SMOKE DETECTOR CEILING OR WALL MOUNTED - ROUGH-IN ONLY	-
H	HEAT DETECTOR CEILING OR WALL MOUNTED - ROUGH-IN ONLY	80" AFF
S	DUCT SMOKE DETECTOR - ROUGH-IN ONLY	-
FACP	FIRE ALARM CONTROL PANEL	-
FAAP	FIRE ALARM ANNUNCIATOR PANEL	-
F	FIRE ALARM BELL BUZZER	-
COMMUNICATION		
2/2	TELEPHONE/DATA OUTLET. WALL MOUNTED - STUB 3/4" C. ABOVE ACCESSIBLE CEILING	15" AFF
2	TELEPHONE OUTLET. WALL MOUNTED - STUB 3/4" C. ABOVE ACCESSIBLE CEILING	15" AFF
2	DATA OUTLET. WALL MOUNTED - STUB 3/4" C. ABOVE ACCESSIBLE CEILING	15" AFF
2/2	FLOOR MOUNTED TELEPHONE/DATA OUTLET - FLUSH MOUNTED UNO	-
2	FLOOR MOUNTED TELEPHONE OUTLET - FLUSH MOUNTED UNO	-
2	FLOOR MOUNTED DATA OUTLET - FLUSH MOUNTED UNO	-
SC	SOUND CONSOLE (RACK)	48" AFF
S S	P.A. SPEAKER, CEILING OR WALL MOUNTED	-
M M	MICROPHONE OUTLET	9" BFC, UNO
DBL	CLOCK - SINGLE OR DOUBLE FACE	-
W	WIRELESS ACCESS POINT	-
TV TV	TELEVISION OUTLET. CLG. OR WALL MOUNTED - STUB 3/4" C. ABOVE ACCESSIBLE CEILING	-
	PUSHBUTTON FOR INTERCOM CALL IN	-
	BUZZER/BELL	48" AFF
	TELEPHONE BOARD	-
	CABLE TRAY	-

GENERAL ABBREVIATIONS

ABS	ABOVE BACK SPLASH	EX	EXISTING	MTD	MOUNT OR MOUNTED	NL	NIGHT LIGHT	SW	SWITCH
AFF	ABOVE FINISHED FLOOR	F	FUSE	MTG	MOUNTING	NO (N.O.)	NORMALLY OPEN	UF	UNDERFLOOR
BFC	BELOW FINISHED CEILING	G	GROUND (EQUIPMENT)	NC (N.C.)	NORMALLY CLOSED	RCPT(S)	RECEPTACLE(S)	UG	UNDERGROUND
C	CONDUIT	GFI	GROUND FAULT INTERRUPTER	NF	NONFUSED	PNL	PANEL	WG	WIRE GUARD
CB	CIRCUIT BREAKER	H	HORIZONTAL MOUNTING	NIC	NOT IN CONTRACT	SO (S.O.)	SPACE ONLY	WP	WEATHERPROOF
CLG	CEILING	IC	INTERRUPTING CAPACITY	TYP	TYPICAL	SP	SPARE	XFMR	TRANSFORMER
EC	EMPTY CONDUIT	IG	ISOLATED GROUND	EP	ELECTRICAL PRIMARY	ST (S.T.)	SHUNT TRIP	UNO	UNLESS NOTED OTHERWISE

NOTES:
1. 48" AFF INDICATES TO TOP OF DEVICE;
   15" AFF INDICATES TO BOTTOM OF DEVICE;
   ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

ELECTRICAL GENERAL NOTES

ELECTRICAL SITE PLAN

A. ELECTRICAL CONTRACTOR SHALL CONTACT UTILITY COMPANY SERVICE REPRESENTATIVE AND COORDINATE SERVICE INSTALLATION PRIOR TO COMMENCING WORK.

B. ELECTRICAL CONTRACTOR SHALL COORDINATE SERVICE ENTRANCE REQUIREMENTS FOR TELEPHONE WITH LOCAL TELEPHONE SERVICE COMPANY PRIOR TO COMMENCING WORK.

C. ELECTRICAL CONTRACTOR SHALL PROVIDE FOUNDATIONS FOR ALL LIGHT POLES SHOWN ON DRAWINGS.

D. ELECTRICAL CONTRACTOR SHALL INSTALL ALL UNDERGROUND CONDUIT, CONDUCTORS, AND CABLE AS SPECIFIED IN PROJECT MANUAL.

ELECTRICAL LIGHTING PLAN NOTES

A. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN (RCP) FOR EXACT LOCATION OF LIGHT FIXTURES. FURNISH FIXTURES WITH TRIM COMPATIBLE WITH THE TYPE OF CEILING AS INDICATED ON THE RCP.

B. CONNECT EXIT/EMERCENCY LIGHTS AND EMERGENCY BALLASTS IN EMERGENCY LIGHTS IN EACH SPACE TO UNSWITCHED HOT LEG OF LOCAL LIGHTING CIRCUIT.

C. COORDINATE PLACEMENT OF FIXTURES WITH ACTUAL INSTALLATION OF MECHANICAL EQUIPMENT AND DUCTWORK.

D. SWITCH LEGS ARE NOT SHOWN WHERE DIGITAL SWITCHES ARE USED TO CONTROL LIGHTS.

E. CONTRACTOR SHALL INCLUDE IN HIS BID TO OWNER THE COST OF ALL CONTROL PANELS, DEVICES, NETWORK CABLING AND LOW OR LINE VOLTAGE WIRING FOR A COMPLETE LIGHTING CONTROL SYSTEM AS SPECIFIED. REFER TO MANUFACTURERS WIRING DIAGRAMS AND INSTALLATION MANUALS PRIOR TO BID.

F. CONTROL SYSTEM FOR LIGHTING IS DESIGNED TO MEET 2015 INTERNATIONAL ENERGY CONSERVATION CODE. ALL LIGHT SWITCHES SHALL OPERATE AS BOTH MANUAL AND AUTOMATIC LINE VOLTAGE SWITCHES OR AS MOMENTARY DIGITAL SWITCHES IN CONJUNCTION WITH RELAY CONTROL PANELS, UNLESS OTHERWISE NOTED. REFER TO ELECTRICAL GENERAL LEGEND.

G. ALL CONTROL AND POWER WIRING FOR LIGHTING CONTROL SYSTEM SHALL BE IN CONDUIT.

H. COORDINATE LOCATION OF LIGHTS WITH DIFFUSERS AND GRILLS.

I. USE #10 AWG CONDUCTORS FOR 20 AMPERE, 120 VOLT BRANCH CIRCUITS LONGER THAN 100 FEET.

J. USE #10 AWG CONDUCTORS FOR 20 AMPERE, 227 VOLT BRANCH CIRCUITS LONGER THAN 200 FEET.

ELECTRICAL POWER PLAN NOTES

A. MOUNTING HEIGHT OF DEVICES AS PER PROJECT SPECIFICATIONS UNLESS NOTED OTHERWISE.

B. COORDINATE ROUGH-IN LOCATION OF ALL DEVICES WITH ARCHITECTURAL ELEVATIONS DETAILS, AND PLANS.

C. REFER TO ARCHITECTURAL MILLWORK AND ELEVATION PLANS FOR EXACT LOCATION AND MOUNTING HEIGHT OF ALL WIRING DEVICES.

D. ALL PENETRATIONS THROUGH FIRE RATED WALLS SHALL HAVE SOUND RETARDING/ABSORBING FIRE STOP MATERIAL.

E. FURNISH AND INSTALL TV OUTLET AND TV RECEPTACLE IN SEPARATE BACKBOX AND WALL PLATE.

F. USE #10 AWG CONDUCTORS FOR 20 AMPERE, 120 VOLT BRANCH CIRCUITS LONGER THAN 100 FEET.

ELECTRICAL GENERAL

A. ELECTRICAL INSTALLATION SHALL COMPLY WITH LOCAL, STATE, AND FEDERAL CODES, AND:

- NFPA 70 (NEC-2017)
- NFPA 72 - 2018
- IFC - 2018
- IECC - 2015

ELECTRICAL SPECIAL SYSTEMS PLAN NOTES

A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER SOURCE WIRING IN ACCORDANCE WITH ARCHITECTURAL MILLWORK. ALL INSTALLATIONS SHALL COMPLY WITH ADA REQUIREMENTS.

B. ELECTRICAL CONTRACTOR SHALL VERIFY ALL REQUIREMENTS BEFORE ANY ROUGH-IN IN ORDER TO COORDINATE MANUFACTURER'S DRAWINGS FOR EQUIPMENT LOCATION AND INSTALLATION ACCESSORIES.

C. COORDINATE RUNS FOR CONDUIT UP IN JOIST AND FOR SUSPENDING REQUIREMENTS IN ACCORDANCE WITH STRUCTURAL PLANS.

D. ALL FIRE ALARM, INTERCOM, DATA, AND TV DEVICES SHALL BE STUBBED UP TO ABOVE ACCESSIBLE CEILING AND TO CABLE TRAY IF PRESENT.

E. ALL PENETRATIONS THROUGH FIRE RATED WALLS SHALL HAVE SOUND RETARDING/ABSORBING FIRE STOP MATERIAL.

F. FURNISH AND INSTALL TV OUTLET AND TV RECEPTACLE IN SEPARATE BACKBOX AND WALL PLATE.

G. IF CABLE TRAY IS SHOWN ON PLANS, PROVIDE CABLE TRAY AS SPECIFIED IN PROJECT SPECIFICATIONS.

H. FURNISH DUCT SMOKE DETECTOR FOR RETURN DUCT. COORDINATE EXACT LOCATION IN ACCORDANCE MECHANICAL DRAWINGS.

I. ALL DEVICES SHOWN ON DRAWINGS ARE SYMBOLIC ONLY. THE ENTIRE FIRE ALARM SYSTEM. SHALL BE IN FULL COMPLIANCE AND MEET ALL CODES AND REQUIREMENTS OF THE LOCAL ADMINISTRATIVE AUTHORITY. ANY MODIFICATIONS REQUIRED TO PROVIDE COMPLIANCE SHALL BE MADE AT NO ADDITIONAL COST TO THE OWNER OR ARCHITECT/ENGINEER.

J. FIRE ALARM LICENSE HOLDER SHALL ASSUME ALL RESPONSIBILITY FOR DESIGN AND SUBMIT DRAWINGS TO AUTHORITY HAVING JURISDICTION (AHJ) AND ABIDE BY ALL OTHER REQUIREMENTS PER NFPA.

K. ALL CABLES ABOVE CEILING SHALL BE PLENUM RATED.

L. CONDUITS SHALL BE REAMED AND COMPLETED WITH CONNECTORS AND INSULATED BUSHINGS AT BOTH ENDS.

M. BETWEEN ANY TWO PULL POINTS THERE SHALL BE NO CONDUIT WITH GREATER THAN 180 DEGREES OF BENDS OR EQUIVALENT.

N. WHERE CONDUIT LENGTH EXCEEDS 100FT AND/OR TWO 90 DEGREE BENDS OR EQUIVALENT PROVIDE PULL BOXES AS REQUIRED.

O. ALL ZONE CONDUITS (HOME RUN) FOR LOW VOLTAGE COMMUNICATIONS CABLING SHALL BE MARKED AT THEIR TERMINUS WITH A TAG THAT IDENTIFIES "FIRE ALARM, DATA, INTERCOM, ETC" (ROOM NAME AND NUMBER) WHERE THE OTHER END OF THE CONDUIT TERMINATES.

P. FURNISH AND INSTALL 8'H X 4'W X 3/4"T VERTICALLY HUNG, GRADE AC, PLYWOOD IN COMMUNICATION ROOM AS INDICATED ON PLANS. PAINT PLYWOOD WITH TWO COATS OF FIRE RETARDANT TO MATCH EXISTING WALL FINISH. COORDINATE WITH ARCHITECT, PRIME CONTRACTOR, AND OWNER FOR INSTALLATION OF BACKBOARD. REFER TO DRAWINGS FOR PROPOSED LOCATION AND DETAILS.

G. THE CONTRACTOR SHALL INCLUDE IN HIS BID TO THE OWNER MATERIAL AND LABOR REQUIRED TO FURNISH AND INSTALL SMOKE DUCT DETECTORS TO THE AHU'S. FURNISH AND INSTALL TESTING SWITCH. FURNISH LABEL OF AHU SERVED TO EACH TESTING SWITCH, AS REQUIRED BY CODE.

MECHANICAL & PLUMBING EQUIPMENT NOTES

A. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR WIRING TO MECHANICAL EQUIPMENT SHOWN ON THIS SHEET.

B. FOR MECHANICAL EQUIPMENT, FURNISH AND INSTALL BRANCH CIRCUIT AND DISCONNECTING MEANS PER MECHANICAL EQUIPMENT CONNECTION SCHEDULE.

C. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER SOURCE WIRING IN ACCORDANCE WITH ARCHITECTURAL MILLWORK.

D. CONTRACTOR SHALL VERIFY ALL REQUIREMENTS BEFORE ANY ROUGH-IN IN ORDER TO COORDINATE MANUFACTURER'S DRAWINGS FOR EQUIPMENT LOCATION AND INSTALLATION ACCESSORIES.

E. COORDINATE RUNS FOR CONDUIT UP IN JOIST AND FOR SUSPENDING REQUIREMENTS IN ACCORDANCE STRUCTURAL PLANS.

F. REFER TO DIVISION 23 FOR EXACT LOCATION OF ALL MECHANICAL EQUIPMENT. COORDINATE EXACT LOCATION OF ALL MECHANICAL EQUIPMENT IN ACCORDANCE WITH MECHANICAL DRAWINGS TO MEET ELECTRICAL AND MECHANICAL REQUIRED CLEARANCE BY THE LATEST CODE. SOME EQUIPMENT LOCATED ON ROOF.

G. COORDINATE ALL ROOF PENETRATIONS WITH CONTRACTOR AND ALL OTHER TRADES. SEAL ALL ROOF PENETRATIONS AS RECOMMENDED BY THE WARRANTY SYSTEM. VERIFY WITH CONTRACTOR.

H. ELECTRICAL CONTRACTOR SHALL PROVIDE J-BOX AND ONE INCH CONDUIT (1"C) FOR H.V.A.C. CONTROLS AND THERMOSTATS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.

I. ELECTRICAL CONTRACTOR SHALL PROVIDE STARTERS, RELAYS, CONTACTORS AND THE REQUIRED ELECTRICAL ACCESSORIES FOR AN OPERABLE MECHANICAL SYSTEM.

J. ALL ELECTRICAL CONDUIT AND WIRING SHALL BE CONCEALED. IF NOT POSSIBLE PROVIDE SURFACE MOUNT STEEL RACEWAY. STEEL RACEWAY SHALL BE WIREMOLD #V2100 SERIES. PROVIDE ALL RELATED #V2100 SERIES ACCESSORIES FOR AN OPERABLE SYSTEM.

K. ALL CABLES ABOVE CEILING SHALL BE PLENUM RATED.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
TBPE FIRM #F-312

Revision No.	Date	Description

STATE OF TEXAS
GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
11-6-2020

Project No.:	32885.001
Issued:	11-06-2020
Drawn By:	J.M.
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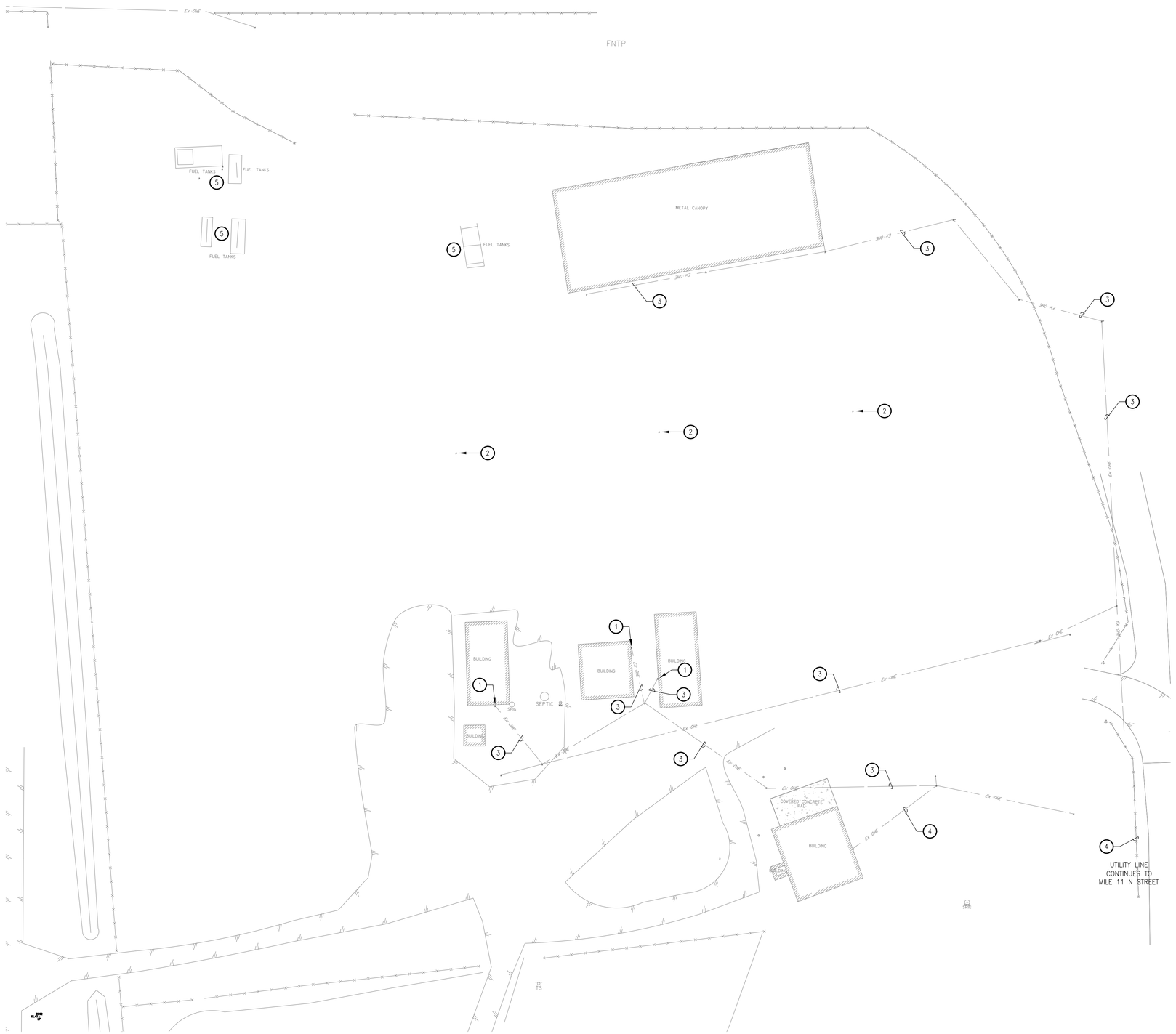
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ELECTRICAL GENERAL LEGEND

E001
Sheet Number

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GENERAL NOTES:

A. REFER TO SHEET E001 FOR ELECTRICAL GENERAL NOTES.



KEY NOTES: (#)

1. EXISTING UTILITY SERVICE SHALL BE COORDINATED WITH POWER COMPANY TO BE REMOVED. THIS SHALL BE ACCOMPLISHED AFTER NEW CONSTRUCTION HAS BEEN COMPLETED AND UTILITY SERVICES HAVE BEEN ESTABLISHED. REFER TO SHEET C2.00 FOR ADDITIONAL REQUIREMENTS.
2. EXISTING LIGHT POLE AND LUMINARIES SHALL BE REMOVED AND RETURNED TO OWNER.
3. EXISTING UTILITY ELECTRICAL OVERHEAD LINE AND ASSOCIATED ACCESSORIES SHALL BE REMOVED BY MVEC. REFER TO KEYNOTE #1 FOR ADDITIONAL REQUIREMENTS. THIS WORK SHALL BE COMPLETED AT A DATE AS REQUESTED BY OWNER.
4. EXISTING OVERHEAD ELECTRICAL LINE TO REMAIN.
5. EXISTING FUEL TANKS. REFER TO DRAWING C3.00 FOR REQUIREMENTS.

01 ELECTRICAL DEMOLITION SITE PLAN
SCALE: 1"=30'

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-2020
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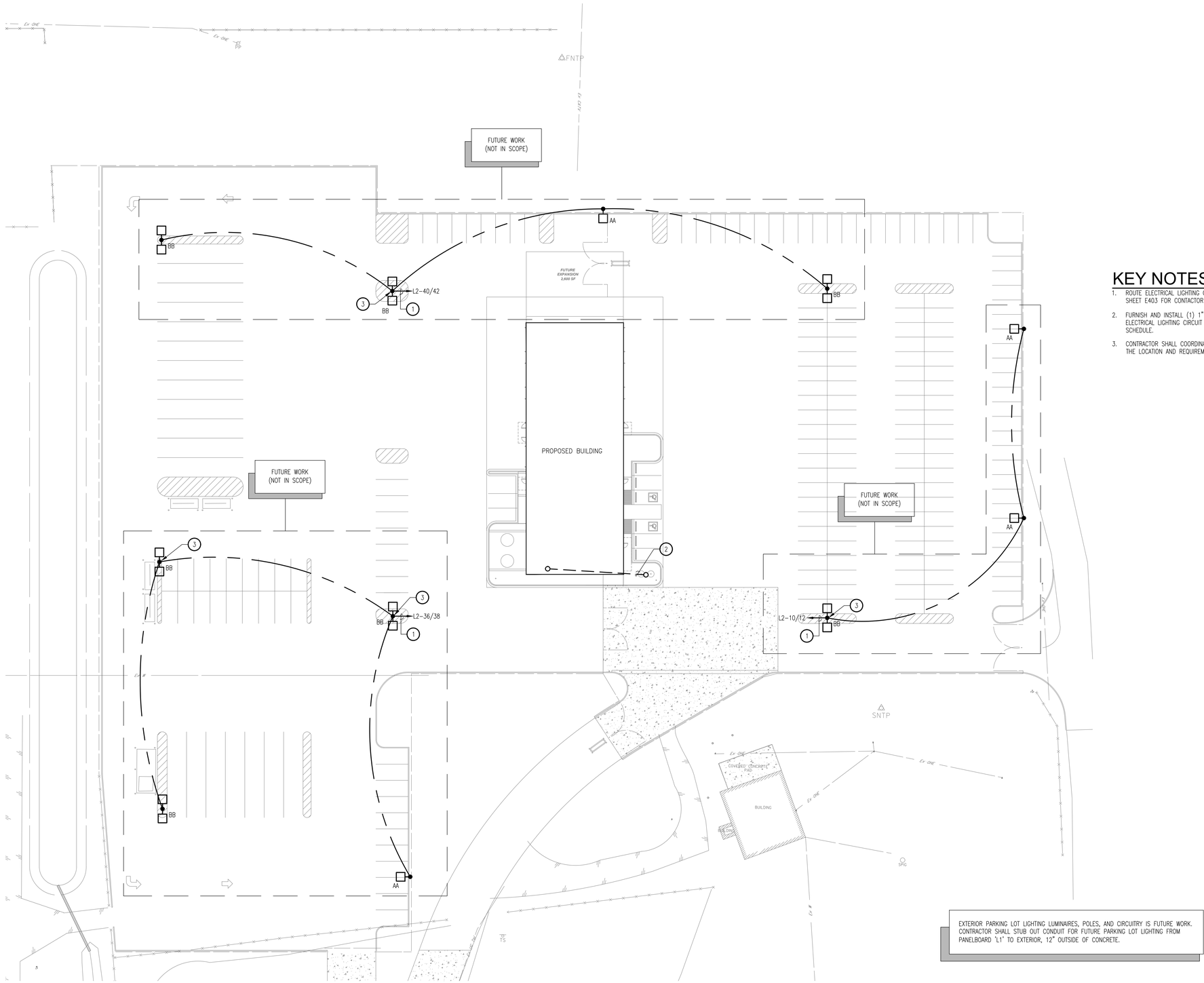
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ELECTRICAL DEMOLITION SITE PLAN

ED101
Sheet Number

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GENERAL NOTES:

A. REFER TO SHEET E001 FOR ELECTRICAL GENERAL NOTES.



KEY NOTES: (#)

1. ROUTE ELECTRICAL LIGHTING CIRCUIT THROUGH LIGHTING CONTACTOR. REFER TO SHEET E403 FOR CONTACTOR PANEL DETAIL.
2. FURNISH AND INSTALL (1) 1" CONDUIT FOR FLAG POLE LIGHTING. ROUTE ELECTRICAL LIGHTING CIRCUIT THROUGH LIGHTING CONTACTOR AND RELAY PANEL SCHEDULE.
3. CONTRACTOR SHALL COORDINATE WITH LIGHT POLE AND CAMERA MANUFACTURERS THE LOCATION AND REQUIREMENTS FOR CAMERA MOUNTING AND CABLING HOLES.

01 ELECTRICAL LIGHTING SITE PLAN
SCALE: 1"=30'

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0282
FAX (956) 664-0282
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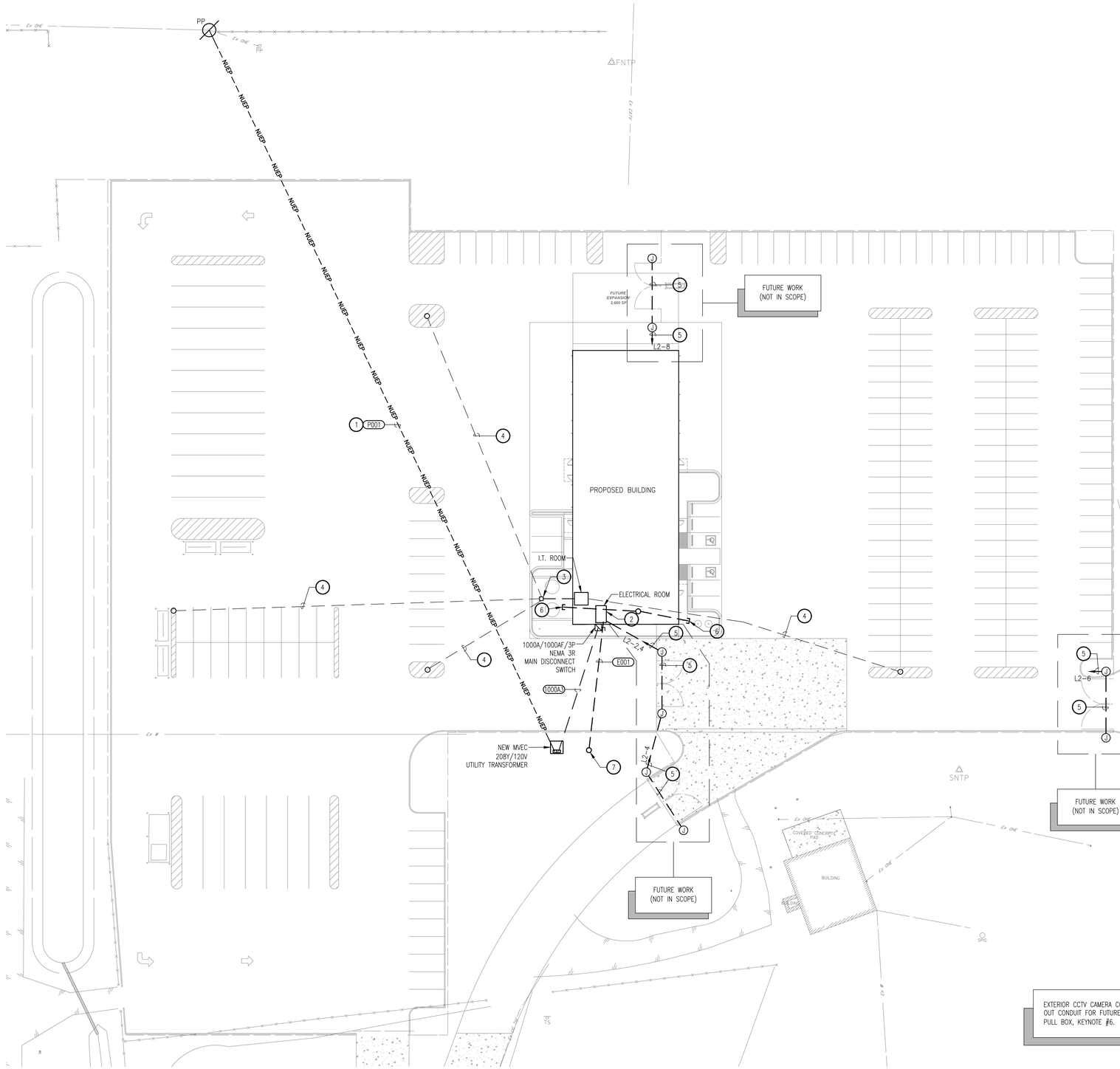
ELECTRICAL LIGHTING SITE PLAN

E101
Sheet Number

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Printed Date: 11/5/2020 2:11:27 PM

GENERAL NOTES:

A. REFER TO SHEET E001 FOR ELECTRICAL GENERAL NOTES.



KEY NOTES: (#)

1. CONTRACTOR SHALL CONTACT MVEC ELECTRICAL SERVICE UTILITY FOR SERVICE COORDINATION AND FINAL REQUIREMENT.
2. CONDUIT TRANSITION TO ABOVE GROUND SHALL BE OF RIGID GALVANIZED MATERIAL.
3. TELECOMMUNICATIONS PULL BOX. REFER TO TELECOMMUNICATIONS DRAWINGS FOR REQUIREMENTS.
4. FURNISH AND INSTALL A 1" CONDUIT FOR POLE MOUNTED CAMERA LOCATIONS. COORDINATE FINAL CONDUIT STUB-UP WITH OWNER.
5. POWER FOR GATE OPERATORS. FURNISH AND INSTALL (1) 1" CONDUIT WITH 2#12, 1#12G FOR 120V, 20A RATED CIRCUIT.
6. EXTEND A 2" CONDUIT 5-FEET FROM BUILDING FOR IRRIGATION CONTROL CABLING. COORDINATE WITH OWNER REPRESENTATIVE FINAL PLACEMENT.
7. STUB UP CONDUIT FROM ELECTRICAL ROOM TO THIS APPROXIMATE LOCATION FOR FUTURE STANDBY GENERATOR. PROVIDE WITH NYLON PULL STRING AND END CAPS AT BOTH ENDS.

LEGEND:

- EX OHE — EXISTING OVERHEAD ELECTRICAL POWER LINE
- NUEP — NUEP — NEW UNDERGROUND ELECTRICAL PRIMARY LINE
- — — — — NEW UNDERGROUND ELECTRICAL SECONDARY LINE
- — — — — UNDERGROUND ELECTRICAL
- — — — — NEW UNDERGROUND CONDUIT FOR TELECOM CABLING

EXTERIOR CCTV CAMERA CONDUITS SHALL BE FUTURE WORK. CONTRACTOR SHALL STUB OUT CONDUIT FOR FUTURE CCTV CAMERAS FROM IT ROOM TO EXTERIOR COMMUNICATION PULL BOX, KEYNOTE #6.

01 ELECTRICAL POWER SITE PLAN

SCALE: 1"=30'

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
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ELECTRICAL POWER SITE PLAN

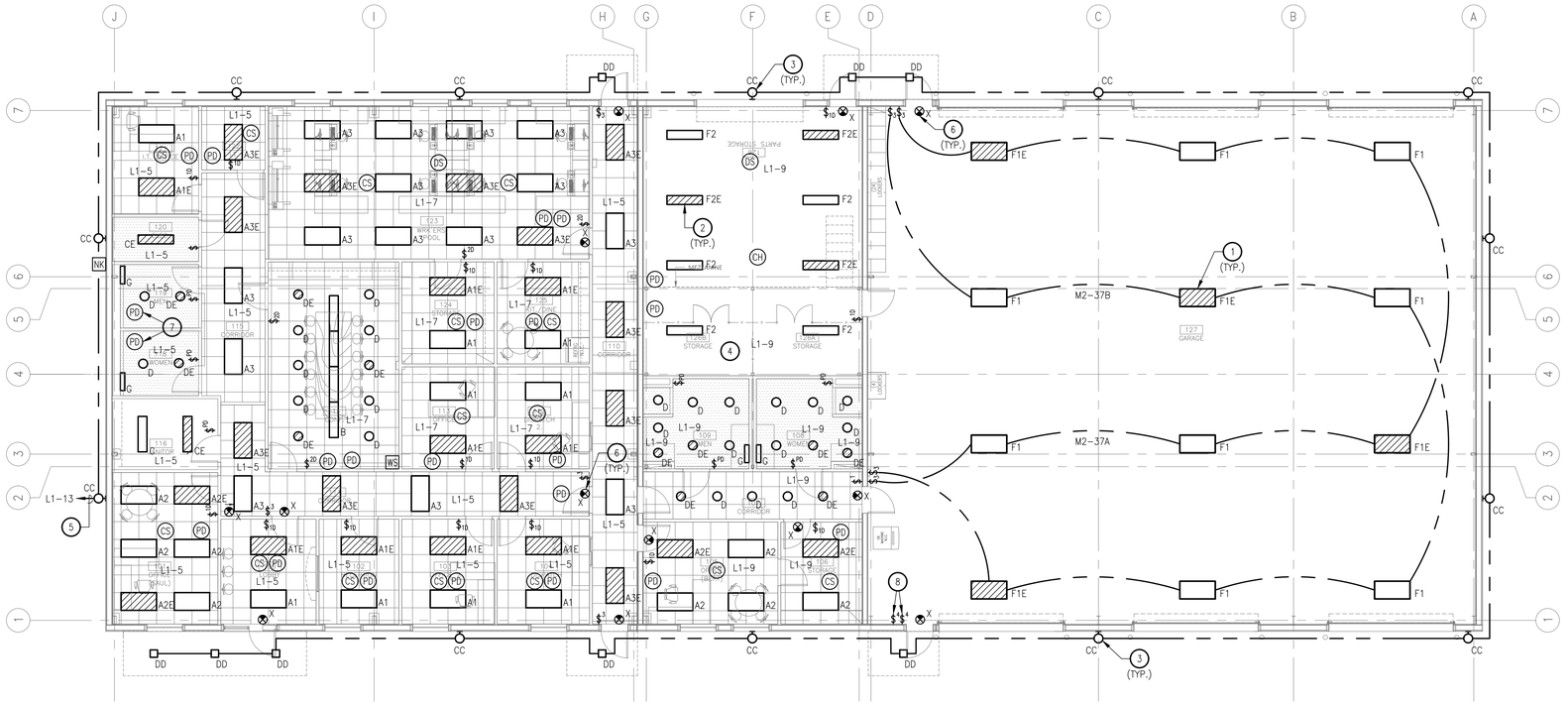
E102

Sheet Number

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Printed Date: 11/5/2020 2:11:32 PM

GENERAL NOTES:

A. REFER TO SHEET E001 FOR ELECTRICAL GENERAL NOTES.



KEY NOTES: (#)

1. MOUNT FIXTURE TYPE 'F1' AT 15'-0"AFF.
2. MOUNT FIXTURE TYPE 'F2' AT 15'-0"AFF.
3. MOUNT EXTERIOR FIXTURE TYPE 'CC' AT 12'-0"AFF.
4. FURNISH AND INSTALL QUANTITY OF (2) TYPE 'C' AND (1) TYPE 'CE' FIXTURES UNDER MEZZANINE. CONNECT TO CIRCUIT IN SPACE.
5. ROUTE EXTERIOR LIGHTING CIRCUIT THROUGH LIGHTING CONTACTOR. REFER TO SHEET E403 FOR CONTACTOR PANEL DETAIL.
6. TYPICAL FOR ALL EXIT SIGN FIXTURES, CONNECT TO UN-SWITCHED CIRCUIT LEG.
7. PROVIDE RELAY POWER PACK FOR EXHAUST FAN CONTROL WITH SPACE LIGHTS.
8. FOUR WAY TOGGLE SWITCH SHALL CONTROL LUMINAIRES IN SPACE.

01 ELECTRICAL LIGHTING PLAN

SCALE: 1/8" = 1'-0"

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0282
FAX (956) 664-0282
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ELECTRICAL LIGHTING PLAN

E201

Sheet Number

File Name: I:\32000s\32885\001\MEP\CADD\E201-LP-32885.001.dwg
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GENERAL NOTES:

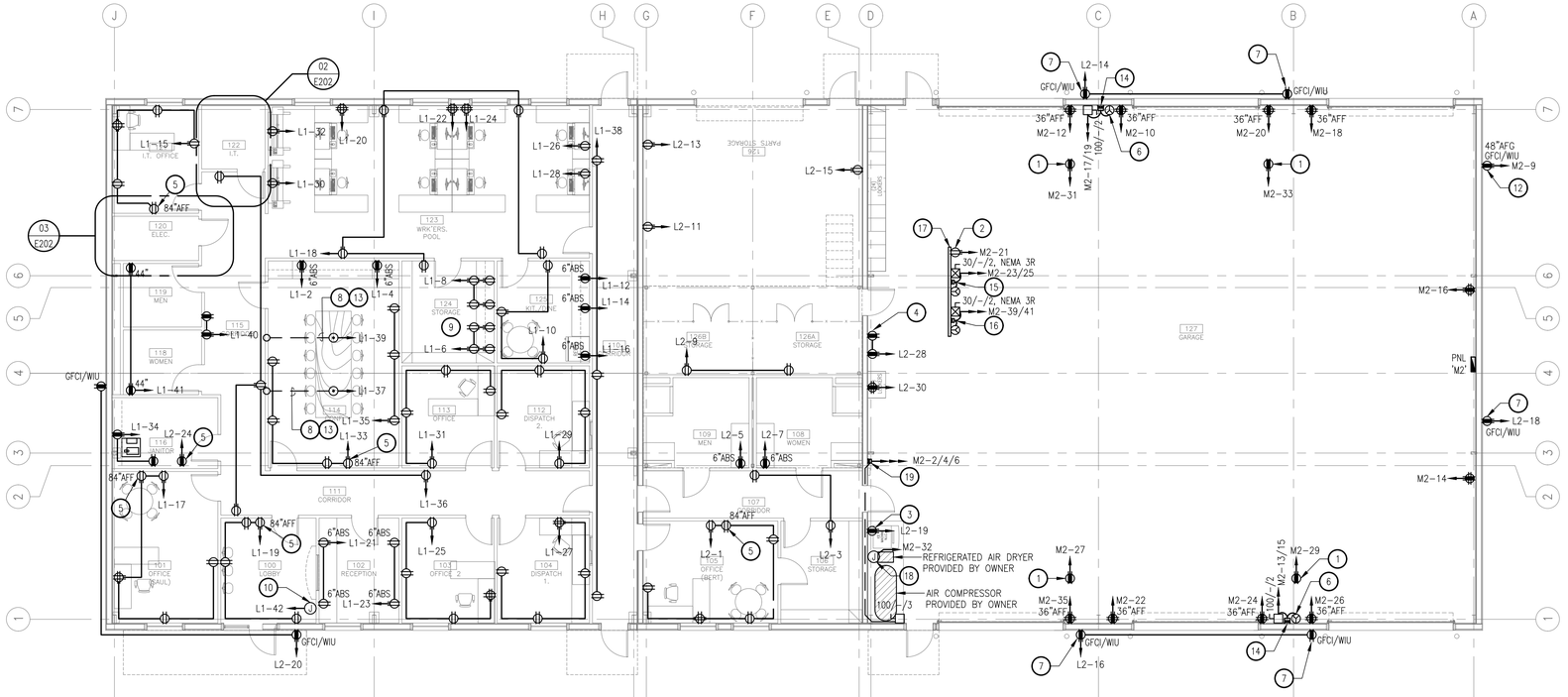
A. REFER TO SHEET E001 FOR ELECTRICAL GENERAL NOTES.

B. ALL ELECTRICAL EQUIPMENT IN GARAGE 127, PARTS STORAGE 126, AND EXTERIOR SHALL BE TYPE NEMA 3R.

C. CONTRACTOR SHALL FIELD VERIFY ELECTRICAL INSTALLATION OF GARAGE EQUIPMENT WITH OWNER'S REPRESENTATIVE/PROGRAM MANAGER PRIOR TO COMMENCING WORK.

KEY NOTES: (#)

1. FURNISH AND INSTALL AN INDUSTRIAL GRADE HEAVY DUTY RETRACTABLE DROP CORD REEL WITH STRAIN RELIEF AND BALL STOP; TYPE WOODHEAD# 92583N. FURNISH AND INSTALL WITH A NEMA 5-20R TWIST LOCK RECEPTACLE. CORD REEL SHALL BE SECURELY SUPPORTED TO BUILDING STRUCTURE. ROUTE 2#12, 1#12G, 3/4"C.
2. POWER FOR SHOP VEHICLE TIRE CHANGING EQUIPMENT. EXTEND A 3/4" CONDUIT, UNDER SLAB, TO EQUIPMENT DISCONNECT TERMINALS. PROVIDE WITH 2#12,1#12G. COORDINATE FINAL LOCATION WITH OWNER.
3. POWER TO ICE MACHINE. RECEPTACLE SHALL BE OF GFCI TYPE.
4. POWER TO E.W.C. EQUIPMENT. RECEPTACLE SHALL BE OF GFCI TYPE.
5. POWER FOR FLAT SCREEN TELEVISION. COORDINATE FINAL RECEPTACLE HEIGHT AND WALL LOCATION WITH TRADES INSTALLING THE TELEVISION MOUNT.
6. FURNISH AND INSTALL A 220V, 50A, 2-POLE NEMA 50R RECEPTACLE FOR WELDING EQUIPMENT.
7. MOUNT RECEPTACLE AT 36-INCHES ABOVE FINISHED GRADE.
8. FURNISH AND INSTALL A 1-INCH CONDUIT UNDERGROUND AND INTO POWER FLOOR BOX. ROUTE CONDUIT FROM FLOOR BOX UP INTO WALL CAVITY AND INTO A J-BOX. EXTEND CIRCUIT HOME RUN FROM J-BOX TO PANEL BOARD.
9. FURNISH AND INSTALL TWO ROWS OF DUPLEX RECEPTACLES FOR RADIO CHARGING STATIONS. ONE ROW AT 6" ABOVE COUNTER TOP. THE SECOND ROW AT 12" ABOVE COUNTER TOP. ALL RECEPTACLES ABOVE COUNTER SHALL BE HORIZONTALLY MOUNTED.
10. POWER FOR FIRE ALARM ANNUNCIATING PANEL.
11. POWER FOR FIRE ALARM CONTROL PANEL. OVERCURRENT PROTECTION BREAKER FEEDING THIS CIRCUIT SHALL BE PROVIDED IN RED COLOR, LOCKABLE TYPE.
12. POWER FOR PRESSURE WASHER. COORDINATE RECEPTACLE TYPE WITH EQUIPMENT PRIOR TO ROUGH-IN.
13. REFER TO TELECOMMUNICATIONS DRAWINGS FOR FLOOR BOX SPECIFICATIONS. PROVIDE A 120V, 20A RATED DUPLEX RECEPTACLE WITHIN FLOOR BOX PER MANUFACTURER'S RECOMMENDATIONS.
14. PROVIDE 208V/1-PH TO 240V/1-PH BUCK/BOOST TRANSFORMER FOR WELDING EQUIPMENT. MOUNT TRANSFORMER ON WALL ADJACENT TO RECEPTACLE OUTLET FOR WELDER. TRANSFORMER BASIS OF DESIGN: SQARE D #1.5S46F NEMA 3R. WIRE TRANSFORMER PER MANUFACTURES INSTALLATION INSTRUCTIONS. EXTEND A 1-1/2" CONDUIT, UNDER SLAB, TO EQUIPMENT DISCONNECT TERMINALS. PROVIDE WITH 2#4,1#8G. COORDINATE FINAL LOCATION WITH OWNER.
15. PROVIDE 208V/1-PH TO 240V/1-PH BUCK/BOOST TRANSFORMER FOR TIRE CHANGER (LARGE) EQUIPMENT. MOUNT TRANSFORMER ON EQUIPMENT RACK ADJACENT TO RECEPTACLE OUTLET FOR EQUIPMENT. TRANSFORMER BASIS OF DESIGN: SQUARE D #500SV43B NEMA 3R. WIRE TRANSFORMER PER MANUFACTURES INSTALLATION INSTRUCTIONS. EXTEND A 3/4" CONDUIT, UNDER SLAB, TO EQUIPMENT DISCONNECT TERMINALS. PROVIDE WITH 2#12,1#12G. COORDINATE FINAL LOCATION WITH OWNER.
16. PROVIDE 208V/1-PH TO 240V/1-PH BUCK/BOOST TRANSFORMER FOR TIRE BALANCER EQUIPMENT. MOUNT TRANSFORMER ON EQUIPMENT RACK ADJACENT TO RECEPTACLE OUTLET FOR EQUIPMENT. TRANSFORMER BASIS OF DESIGN: SQUARE D #500SV46B NEMA 3R. WIRE TRANSFORMER PER MANUFACTURES INSTALLATION INSTRUCTIONS. EXTEND A 3/4" CONDUIT, UNDER SLAB, TO EQUIPMENT DISCONNECT TERMINALS. PROVIDE WITH 2#10,1#10G. COORDINATE FINAL LOCATION WITH OWNER.
17. PROVIDE UNI-STRUT SUPPORT RACK FOR MOUNTING OF NEW BUCK/BOOST TRANSFORMERS, DISCONNECT SWITCHES AND RECEPTACLE DEVICES FOR TIRE SERVICING EQUIPMENT. FIELD VERIFY EQUIPMENT LAYOUT AND COORDINATE INSTALLATION OF NEW RACK WITH OWNER PRIOR TO CONSTRUCTION OF RACK. INCOMING BRANCHES FORM PANEL SHALL BE ROUGHED IN BELOW SLAB. UNISTRUT SHALL BE OF DOUBLE STAINLESS STEEL CONSTRUCTION. ALL HARDWARE SHALL BE OF STAINLESS STEEL CONSTRUCTION.
18. POWER FOR AIR DRYER. FURNISH AND INSTALL 120V, 20A CIRCUIT WITH 2#12, 1#12G, IN 3/4" CONDUIT. PROVIDE WITH MOTOR RATED SWITCH AND MOUNT SWITCH ON WALL WITH FLEX CONNECTION TO AIR DRYER.
19. PROVIDE (2) 208V/3-PH TO 240V/3-PH BUCK/BOOST TRANSFORMERS FOR AIR COMPRESSOR EQUIPMENT. MOUNT TRANSFORMERS ON WALL. TRANSFORMER BASIS OF DESIGN: SQUARE D #2S46F NEMA 3R. WIRE TRANSFORMERS PER MANUFACTURES INSTALLATION INSTRUCTIONS. EXTEND A 1-1/2" CONDUIT, UNDER SLAB, TO EQUIPMENT DISCONNECT TERMINALS. PROVIDE WITH 3#1,1#8G. COORDINATE FINAL LOCATION WITH OWNER.
20. POWER FOR IRRIGATION CONTROLLER. COORDINATE FINAL LOCATION WITH OWNER REPRESENTATIVE.
21. MOUNT RECEPTACLE FLUSH TO SUSPENDED CEILING.


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02 E202
03 E202
GFCI/WIU
L2-20
L2-16
L2-18
L2-28
L2-30
M2-16
M2-14
PNL 'M2'
48"AFG GFCI/WIU M2-9
M2-2/4/6
M2-32 REFRIGERATED AIR DRYER PROVIDED BY OWNER
AIR COMPRESSOR PROVIDED BY OWNER
M2-17/19 100/-/3
M2-31
M2-33
M2-35
M2-22
M2-27
M2-13/15 100/-/2
M2-29
M2-24
M2-26
M2-12
M2-10
M2-20
M2-18
M2-21 30/-/2, NEMA 3R M2-23/25
30/-/2, NEMA 3R M2-39/41
84"AFF
44"
36"AFF
48"AFG
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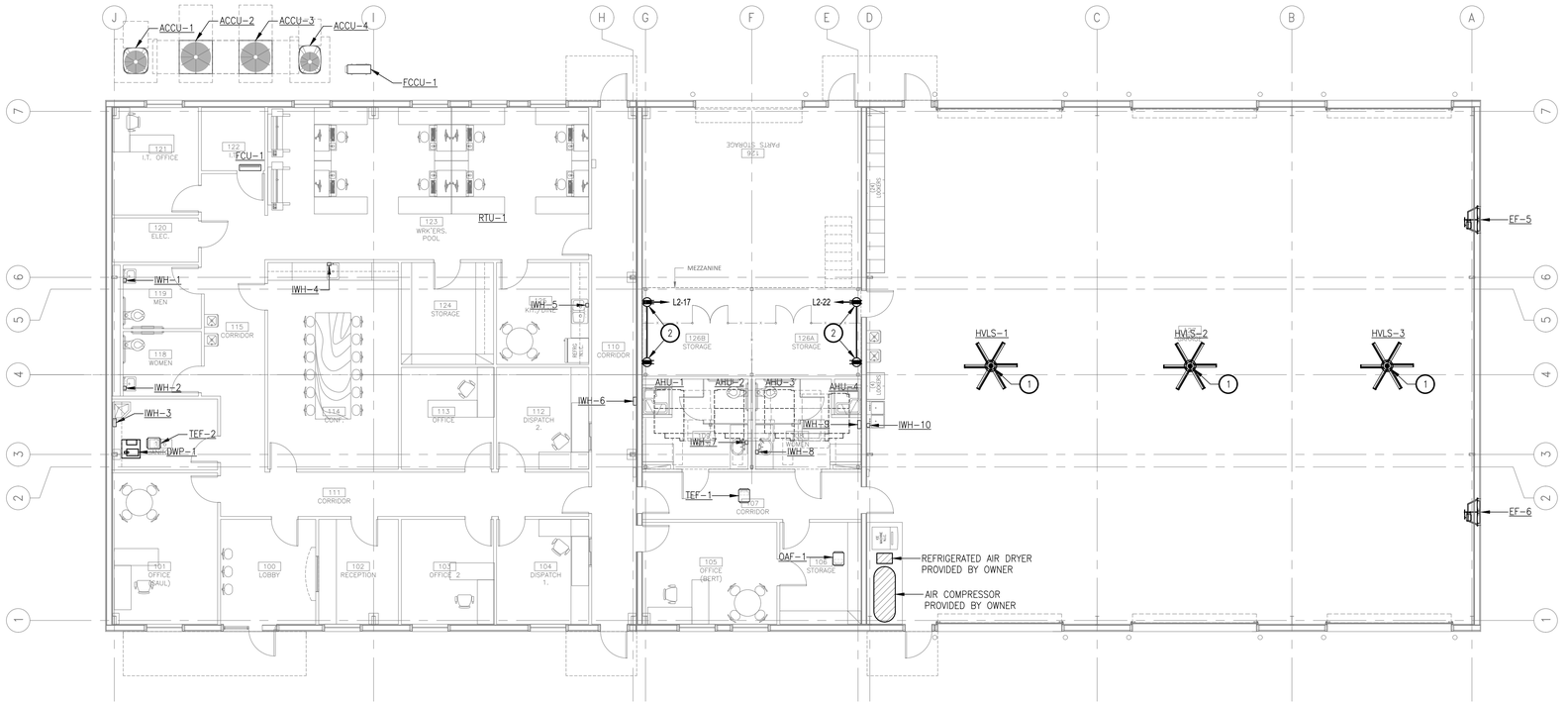
GENERAL NOTES:

A. REFER TO SHEET E001 FOR ELECTRICAL GENERAL NOTES.

B. REFER TO MECHANICAL EQUIPMENT CONNECTION SCHEDULE ON SHEET E303 FOR ELECTRICAL REQUIREMENTS.

KEY NOTES: (i)

1. HVLS FAN SWITCHED AS PER MECHANICAL DRAWINGS.
2. FURNISH AND INSTALL 120V, 20A RATED GFCI RECEPTACLE 18" ABOVE MEZZANINE FLOOR.



01 MECHANICAL EQUIPMENT CONNECTIONS

SCALE: 1/8" = 1'-0"

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
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MECHANICAL EQUIPMENT CONNECTIONS

E203

Sheet Number

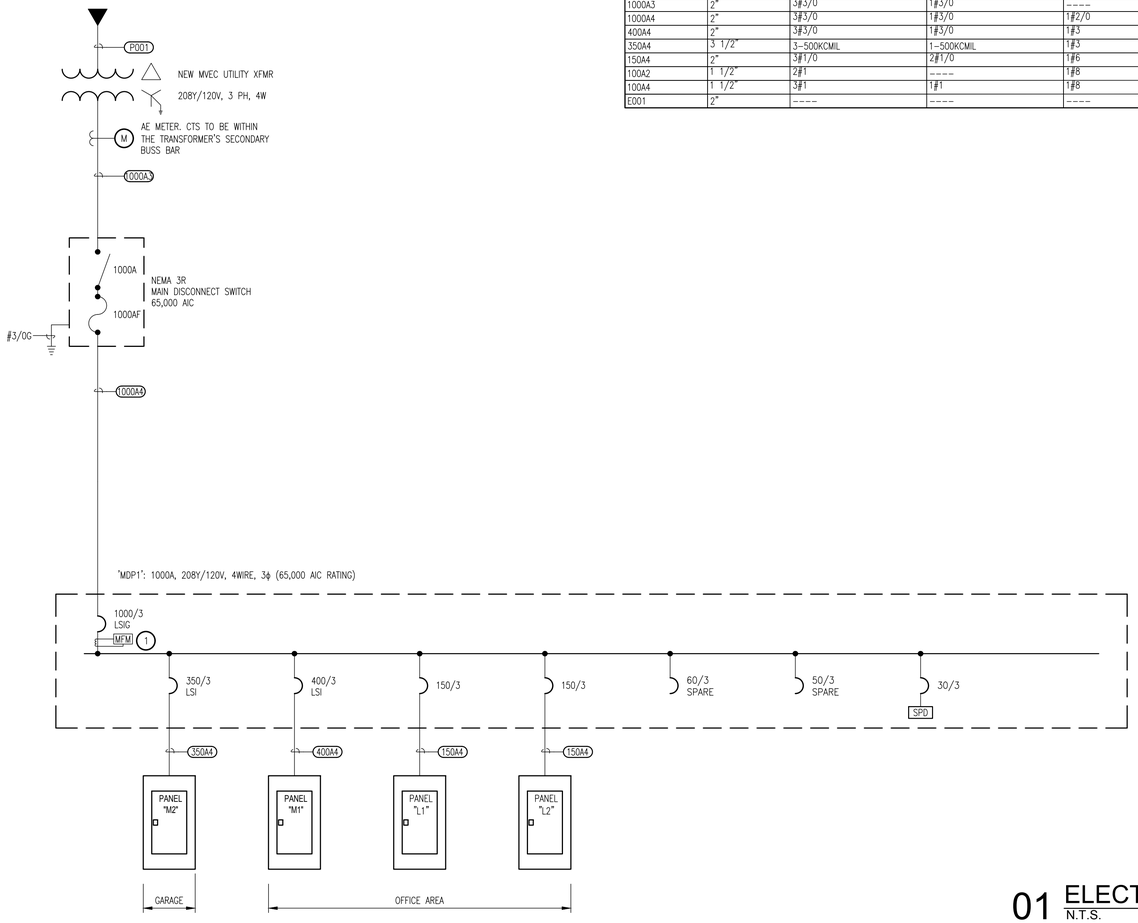
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GENERAL NOTES:

A. REFER TO SHEET E001 FOR ELECTRICAL GENERAL NOTES.

FEEDER / BRANCH CIRCUIT SCHEDULE

MARK	RACEWAY	PHASE CONDUCTORS	NEUTRAL CONDUCTORS	GROUND CONDUCTORS	REMARKS
P001	4"	----	----	----	----
1000A3	2"	3#3/0	1#3/0	----	FIVE PARALLEL FEEDERS REQUIRED
1000A4	2"	3#3/0	1#3/0	1#2/0	FIVE PARALLEL FEEDERS REQUIRED
400A4	2"	3#3/0	1#3/0	1#3	TWO PARALLEL FEEDERS REQUIRED
350A4	3 1/2"	3-500KCMIL	1-500KCMIL	1#3	----
150A4	2"	3#1/0	2#1/0	1#6	----
100A2	1 1/2"	2#1	----	1#8	----
100A4	1 1/2"	3#1	1#1	1#8	----
E001	2"	----	----	----	FIVE PARALLEL SPARE CONDUITS REQUIRED



01 ELECTRICAL ONE-LINE DIAGRAM
N.T.S.

KEY NOTES: (1)

1. PROVIDE WITH ARC FLASH MITIGATING MAINTENANCE MODE SWITCH ON POWER CIRCUIT BREAKER.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0282
FAX (956) 664-0282
TBPE FIRM #F-312

Revision No.	Date	Description

STATE OF TEXAS
GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
11-6-2020

Project No.:	32885.001
Issued:	11-06-2020
Drawn By:	J.M.
Checked By:	G.B.
Scale:	AS NOTED

Sheet Title

ELECTRICAL ONE-LINE DIAGRAM

E301
Sheet Number

File Name: i:\32000s\32885\001\MEP\CADD\E301-LD-32885.001.dwg
Current Tab (Layout): E301 ELECTRICAL ONE-LINE DIAGRAM User: AH2753
Printed Date: 11/5/2020 2:11:59 PM

PANELBOARD 'MDP1'

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ELEC. 120
1000A MAIN BREAKER; LSI — MOUNTING: SURFACE; NEMA 1
BUSES: MAIN – 1000 A; NEUTRAL – 100%; EQUIPMENT GROUND — Isc = 65,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	0	33746	PANEL 'M1'	400/3	1	A	2	350/3	PANEL 'M2'	1152	1440	22108
0	0	42899	"	–	3	B	4	–	"	0	8640	20348
0	0	43344	"	–	5	C	6	–	"	0	2520	17900
2114	10980	0	PANEL 'L1'	150/3	7	A	8	150/3	PANEL 'L2'	865	4860	13346
990	11700	0	"	–	9	B	10	–	"	1360	3420	8150
1349	9180	400	"	–	11	C	12	–	"	2225	3600	15000
0	0		SPARE	60/3	13	A	14	50/3	SPARE	0	0	
0	0		"	–	15	B	16	–	"	0	0	
0	0		"	–	17	C	18	–	"	0	0	
0	0		SPACE		19	A	20		SPACE	0	0	
0	0		SPACE		21	B	22		SPACE	0	0	
0	0		SPACE		23	C	24		SPACE	0	0	
0	0		SPACE		25	A	26	30/3	SPD	0	0	
0	0		SPACE		27	B	28	–	"	0	0	
0	0		SPACE		29	C	30	–	"	0	0	

VA:L (LIGHTING)	10055	CONNECTED	12569	DEMAND
VA:R (RECEPTACLES)	56340	CONNECTED	33170	DEMAND
VA:O (OTHER)	217241	CONNECTED	217241	DEMAND
VA: TOTAL	283636	CONNECTED	262980	DEMAND
AMPS: TOTAL	787	CONNECTED	730	DEMAND

L	R	O		TOTAL			
4131	17280	69200	VA CONNECTED TO A PHASE	90611	VA =	755	AMPS CONNECTED TO A PHASE @ 120 VOLTS
2350	23760	71397	VA CONNECTED TO B PHASE	97507	VA =	813	AMPS CONNECTED TO B PHASE @ 120 VOLTS
3574	15300	76644	VA CONNECTED TO C PHASE	95518	VA =	796	AMPS CONNECTED TO C PHASE @ 120 VOLTS
10055	56340	217241	TOTAL	283636	VA		

PANELBOARD 'M1'

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ELEC. 120
LUGS ONLY — MOUNTING: SURFACE; NEMA 1
BUSES: MAIN – 400 A; NEUTRAL – 100%; EQUIPMENT GROUND — Isc = 42,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	0	2554	AHU-1	30/3	1	A	2	45/3	AHU-2	0	0	3939
0	0	2554	"	–	3	B	4	–	"	0	0	3939
0	0	2554	"	–	5	C	6	–	"	0	0	3939
0	0	3555	AHU-3	45/3	7	A	8	25/3	AHU-4	0	0	2017
0	0	3555	"	–	9	B	10	–	"	0	0	2017
0	0	3555	"	–	11	C	12	–	"	0	0	2017
0	0	790	WEF-1	20/2	13	A	14	20/2	WEF-2	0	0	790
0	0	790	"	–	15	B	16	–	"	0	0	790
0	0	1100	UH-1	20/3	17	C	18	20/3	DWP-1	0	0	1272
0	0	1100	"	–	19	A	20	–	"	0	0	1272
0	0	1100	"	–	21	B	22	–	"	0	0	1272
0	0	998	HVLS-1 THRU HVLS-3	15/2	23	C	24	15/2	FCCU-1 (FCU-1)	0	0	1269
0	0	998	"	–	25	A	26	–	"	0	0	1269
0	0	385	TEF-1	20/1	27	B	28	20/1	TEF-2	0	0	385
0	0	528	OAF-1	20/1	29	C	30	20/1	SPARE	0	0	
0	0	1800	IWH-1	30/2	31	A	32	30/2	IWH-4	0	0	1800
0	0	1800	"	–	33	B	34	–	"	0	0	1800
0	0	1800	IWH-2	30/2	35	C	36	30/2	IWH-5	0	0	1800
0	0	1800	"	–	37	A	38	–	"	0	0	1800
0	0	5600	IWH-3	70/2	39	B	40	110/2	IWH-6	0	0	8650
0	0	5600	"	–	41	C	42	–	"	0	0	8650
0	0	1729	ACCU-1	30/3	43	A	44	45/3	ACCU-2	0	0	2690
0	0	1729	"	–	45	B	46	–	"	0	0	2690
0	0	1729	"	–	47	C	48	–	"	0	0	2690
0	0	2690	ACCU-3	45/3	49	A	50	20/3	ACCU-4	0	0	1153
0	0	2690	"	–	51	B	52	–	"	0	0	1153
0	0	2690	"	–	53	C	54	–	"	0	0	1153
0	0		SPARE	30/3	55	A	56	20/1	SPARE	0	0	
0	0		"	–	57	B	58	20/1	SPARE	0	0	
0	0		"	–	59	C	60	20/1	SPARE	0	0	
0	0		SPARE	20/1	61	A	62	20/1	SPARE	0	0	
0	0		SPARE	20/1	63	B	64	20/1	SPARE	0	0	
0	0		SPARE	20/1	65	C	66	20/1	SPARE	0	0	

VA:L (LIGHTING)	0	CONNECTED	0	DEMAND
VA:R (RECEPTACLES)	0	CONNECTED	0	DEMAND
VA:O (OTHER)	119989	CONNECTED	119989	DEMAND
VA: TOTAL	119989	CONNECTED	119989	DEMAND
AMPS: TOTAL	333	CONNECTED	333	DEMAND

L	R	O		TOTAL			
0	0	33746	VA CONNECTED TO A PHASE	33746	VA =	281	AMPS CONNECTED TO A PHASE @ 120 VOLTS
0	0	42899	VA CONNECTED TO B PHASE	42899	VA =	357	AMPS CONNECTED TO B PHASE @ 120 VOLTS
0	0	43344	VA CONNECTED TO C PHASE	43344	VA =	361	AMPS CONNECTED TO C PHASE @ 120 VOLTS
0	0	119989	TOTAL	119989	VA		

LIGHTING FIXTURE SCHEDULE

TYPE	MANUF & MODEL NUMBER	LAMPS	VA	VOLTAGE	DESCRIPTION	NOTES
A1	LITHONIA – #EPANL-2x4-4800LM-80CRI-40K-MIN10-ZT-MVOLT	LED 4000K	47	MVOLT	2'X4', GENERAL PURPOSE LED TROFFER, ACRYLIC LENS, AND ELECTRONIC DIMMING DRIVER.	
A2	LITHONIA – #EPANL-2x4-4000LM-80CRI-40K-MIN10-ZT-MVOLT	LED 4000K	39	MVOLT	2'X4', GENERAL PURPOSE LED TROFFER, ACRYLIC LENS, AND ELECTRONIC DIMMING DRIVER.	
A3	LITHONIA – #EPANL-2x4-3000LM-80CRI-40K-MIN10-ZT-MVOLT	LED 4000K	26	MVOLT	2'X4', GENERAL PURPOSE LED TROFFER, ACRYLIC LENS, AND ELECTRONIC DIMMING DRIVER.	
B	LITHONIA – #GRD-LLP-16FT-MSL4-80CRI-40K-IDB80LMF-20/80-MIN10-ZT-120-SCT-F1/12F-XX	LED 4000K	100	120	8" WIDE, STEEL HOUSING, SUSPENDED LED LINEAR LUMINAIRE, 16FT LONG WITH 4000K LEDS AND AIRCRAFT CABLE MOUNTING.	
C	LITHONIA – #CLX-L48-3000LM-SEF-FDL-MVOLT-GZ10-40K-80CRI-CLXRW48	LED 4000K	21	MVOLT	4', GENERAL PURPOSE LED STIP LIGHT, ELECTRONIC DIMMABLE DRIVER AND MOUNTING HARDWARE.	
D	LITHONIA – #WF6-LED-40K-MVOLT-XX	LED 4000K	14	MVOLT	6" WAFER RECESSED DOWN LIGHT WITH INTEGRAL MOUNTING CLIPS AND ELECTRONIC DRIVER.	
F1	LITHONIA – #IBG-15000LM-SEF-ACL-GND-MVOLT-GZ10-40K-80CRI-SF-XX-IBAC120M20-WGIBG24	LED 4000K	96	MVOLT	2' LED HIGH BAY FIXTURE WITH ELECTRONIC DIMMABLE DRIVER, AIR CRAFT CABLE MOUNTING, CLEAR ACRYLIC LENS.	
F2	LITHONIA – #IBG-8000LM-SEF-ACL-GND-MVOLT-GZ10-40K-80CRI-SF-XX-IBAC120M20-WGIBG22	LED 4000K	54	MVOLT	2' LED HIGH BAY FIXTURE WITH ELECTRONIC DIMMABLE DRIVER, AIR CRAFT CABLE MOUNTING, CLEAR ACRYLIC LENS.	
G	VISA LIGHTING – #CB3146-L40K-L-MVOLT-GSIL	LED 4000K	29	MVOLT	2' LED LINEAR SCONCE, SURFACE MOUNTING	
AA	LITHONIA – #RSX2 LED-P6-40K-R3-208-RPA-DF-DDBXD KW POLE – #RTSP30-6.8-11-DM10	LED 4000K	247	208	LED AREA LUMINAIRE. ROUND ALUMINUM POLE, 30FT HIEGHT CUT TO 29.5FT. DRILL MOUNTING HOLE FOR A SINGLE FIXTURE MOUNTED AT 90deg. (PAINT TO MATCH LUMINAIRE)	
BB	LITHONIA – #RSX2 LED-P6-40K-R5-208-RPA-DF-DDBXD KW POLE – #RTSP30-6.8-11-DM2180	LED 4000K	494	208	LED AREA LUMINAIRES. ROUND TAPERED STEEL POLE, 30FT HIEGHT CUT TO 29.52FT. DRILL MOUNTING HOLE FOR TWO (2) FIXTURES MOUNTED AT 180deg. (PAINT TO MATCH LUMINAIRE)	
CC	LITHONIA – #WST LED-P3-40K-VW-120-SF-DDBXD	LED 4000K	50	MVOLT	LED WALL PACK.	
DD	INFINILUX – #CLS-D-W-80-03(4000K)	LED 4000K	67	MVOLT	LED CANOPY/SOFFIT FIXTURE.	
X	LITHONIA – #LQM S W 3 R 120/277 EL N SD	LED	6	120/277	POLYCARBONATE EMERGENCY EXIT LIGHT, LED LAMPS, SINGLE/DOUBLE FACE, PROVIDE WITH EMERGENCY BATTERY PACK	

PANELBOARD 'M2'

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: GARAGE 127
350A MAIN BREAKER — MOUNTING: SURFACE; NEMA 3R
BUSES: MAIN – 400 A; NEUTRAL – 100%; EQUIPMENT GROUND — Isc = 25,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	0	1248	PWR: VEHICLE LIFT	25/2	1	A	2	100/3	PWR: AIR COMPRESSOR	0	0	8500
0	0	1248	"	–	3	B	4	–	"	0	0	8500
0	360		PWR: AIR DRYER	20/1	5	C	6	–	"	0	0	8500
0	0	960	PWR: REF-1	20/3	7	A	8	20/1	PWR: PRESSURE WASHER	0	0	1800
0	0	960	"	–	9	B	10	20/1	RECEP: GARAGE	0	720	
0	0	960	"	–	11	C	12	20/1	RECEP: GARAGE	0	720	
0	0	4800	PWR: WELDER	75/2	13	A	14	20/1	RECEP: GARAGE	0	720	
0	0	4800	"	–	15	B	16	20/1	RECEP: GARAGE	0	720	
0	0	4800	PWR: WELDER	75/2	17	C	18	20/1	RECEP: GARAGE	0	720	
0	0	4800	"	–	19	A	20	20/1	RECEP: GARAGE	0	720	
0	0	1200	PWR: TIRE CHANGER SMALL	20/1	21	B	22	20/1	RECEP: GARAGE	0	720	
0	0	1440	PWR: TIRE CHANGER (LARGE)	20/2	23	C	24	20/1	RECEP: GARAGE	0	720	
0	0	1440	"	–	25	A	26	20/1	RECEP: GARAGE	0	720	
0	1080		RECEP: DROP CORD	20/1	27	B	28	20/1	RECEP: WATER COOLER	0	360	
0	1080		RECEP: DROP CORD	20/1	29	C	30	20/1	RECEP: SINK	0	360	
0	1080		RECEP: DROP CORD	20/1	31	A	32	30/3	SPARE	0	0	
0	1080		RECEP: DROP CORD	20/1	33	B	34	–	"	0	0	
0	720		RECEP: GARAGE	20/1	35	C	36	–	"	0	0	
1152	0		LTG: GARAGE	20/1	37	A	38	30/3	SPARE	0	0	
0	0	2200	PWR: TIRE BALANCER	30/2	39	B	40	–	"	0	0	
0	0	2200	"	–	41	C	42	–	"	0	0	

VA:L (LIGHTING)	1152	CONNECTED	1440	DEMAND
VA:R (RECEPTACLES)	12600	CONNECTED	11300	DEMAND
VA:O (OTHER)	60356	CONNECTED	60356	DEMAND
VA: TOTAL	74108	CONNECTED	73096	DEMAND
AMPS: TOTAL	206	CONNECTED	203	DEMAND

L	R	O		TOTAL			
1152	1440	22108	VA CONNECTED TO A PHASE	24700	VA =	206	AMPS CONNECTED TO A PHASE @ 120 VOLTS
0	8640	20348	VA CONNECTED TO B PHASE	28988	VA =	242	AMPS CONNECTED TO B PHASE @ 120 VOLTS
0	2520	17900	VA CONNECTED TO C PHASE	20420	VA =	170	AMPS CONNECTED TO C PHASE @ 120 VOLTS
1152	12600	60356	TOTAL	74108	VA		

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MCALLEN, TEXAS 78503
TEL (956) 664-0282
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Sheet Title
ELECTRICAL SCHEDULES

E302
Sheet Number

File Name: h:\32000s\32885\001\MEP\CADD\E302-SC-32885.001.dwg
Current Tab (Layout): E302 ELECTRICAL SCHEDULES User: AH2753
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MECHANICAL EQUIPMENT CONNECTION SCHEDULE

ROOF TOP UNITS				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
AHU-1	MEZZANINE	M1-1/3/5		60/-/3, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 3#10, 1#10G, 3/4"C
AHU-2	MEZZANINE	M1-2/4/6		60/-/3, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 3#6, 1#10G, 1"C
AHU-3	MEZZANINE	M1-7/9/11		60/-/3, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 3#6, 1#10G, 1"C
AHU-4	MEZZANINE	M1-8/10/12		60/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 3#10, 1#10G, 3/4"C
ROOF TOP UNITS				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
ACCU-1	EXTERIOR	M1-43/45/47		30/-/3, NEMA-3R, 240V DISCONNECT SWITCH. BRANCH: 3#10, 1#10G, 3/4"C
ACCU-2	EXTERIOR	M1-44/46/48		60/-/3, NEMA-3R, 240V DISCONNECT SWITCH. BRANCH: 3#6, 1#10G, 1"C
ACCU-3	EXTERIOR	M1-49/51/53		60/-/3, NEMA-3R, 240V DISCONNECT SWITCH. BRANCH: 3#6, 1#10G, 1"C
ACCU-4	EXTERIOR	M1-50/52/54		30/-/2, NEMA-3R, 240V DISCONNECT SWITCH. BRANCH: 3#12, 1#12G, 3/4"C
WATER HEATERS				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
IWH-1	MEN 119	M1-31/33	4	30/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#10, 1#10G, 3/4"C
IWH-2	WOMEN 118	M1-35/37	4	30/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#10, 1#10G, 3/4"C
IWH-3	JANITOR 116	M1-39/41	4	100/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#4, 1#8G, 1-1/2"C
IWH-4	CONFERENCE 114	M1-32/34	4	30/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#10, 1#10G, 3/4"C
IWH-5	KIT/DINE 125	M1-36/38	4	30/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#10, 1#10G, 3/4"C
IWH-6	CORRIDOR 110	M1-40/42	4	100/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#4, 1#8G, 1-1/2"C
IWH-7	MEN 109	L2-27/29	4	30/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#10, 1#10G, 3/4"C
IWH-8	WOMEN 108	L2-31/33	4	30/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#10, 1#10G, 3/4"C
IWH-9	WOMEN 108	L2-35/37	4	100/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#4, 1#8G, 1-1/2"C
IWH-10	GARAGE 127	L2-39/41	4	60/-/2, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 2#6, 1#10G, 1"C
EXHAUST FANS				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
TEF-1	CEILING	M1-27	1,7	BRANCH: 2#12, 1#12G, 3/4"C
TEF-2	CEILING	M1-28	1,7	BRANCH: 2#12, 1#12G, 3/4"C
REF-3	ROOF	M2-7/9/11	1,6	BRANCH: 3#12, 1#12G, 3/4"C
WEF-1	WALL	L2-36/38	1,3	BRANCH: 2#12, 1#12G, 3/4"C
WEF-2	WALL	L2-40/42	1,3	BRANCH: 2#12, 1#12G, 3/4"C
OAF-1	CEILING	M1-29	1,7	BRANCH: 2#12, 1#12G, 3/4"C
HVLS FANS				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
HVLS-1	GARAGE	M1-23/25	1	BRANCH: 2#12, 1#12G, 3/4"C
HVLS-2	GARAGE	M1-23/25	1	BRANCH: 2#12, 1#12G, 3/4"C
HVLS-3	GARAGE	M1-23/25	1	BRANCH: 2#12, 1#12G, 3/4"C
UNIT HEATERS				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
UH-1	FIRE RISER 117	M1-17/19/21	1	BRANCH: 3#12, 1#12G, 3/4"C
WALL MOUNT SPLIT SYSTEM				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
FCU-1	INDOOR	M1-24/26	2	BRANCH: 2#12, 1#12G, 3/4"C
FCCU-1	INDOOR	M1-24/26	4	30/-/2, NEMA-3R, 240V DISCONNECT SWITCH. BRANCH: 2#12, 1#12G, 3/4"C
AIR COMPRESSOR				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
C-1	STORAGE 126A	M2-2/4/6	4	100/-/3, NEMA-3R, 240V DISCONNECT SWITCH. BRANCH: 3#3, 1#8G, 1-1/2"C
PUMPS				DISCONNECTING MEANS AND/OR
UNIT MARK	LOCATION	FED FROM	NOTES	BRANCH CIRCUIT SIZE
DWP-1	JANITOR 116	M1-18/20/22	4, 5, 8	30/-/3, NEMA-1, 240V DISCONNECT SWITCH. BRANCH: 3#12, 1#12G, 3/4"C

NOTES

1. ELECTRICAL CONTRACTOR SHALL CONNECT CIRCUIT TO INTEGRAL DISCONNECT ON UNIT.
2. EXTEND ELECTRICAL FEEDER FROM OUTDOOR UNIT TERMINAL BLOCK TO INDOOR UNIT. MAKE FINAL CONNECTIONS.
3. PROVIDE WITH MOTOR RATED SWITCH AND MOUNT SWITCH ON EQUIPMENT CABINET WITH FLEX CONNECTION TO FAN.
4. MOUNT DISCONNECT SWITCH ON WALL WITH FLEX, WATER TIGHT CONNECTION TO EQUIPMENT.
5. PROVIDE WITH INTERGRAL VFD PER PLUMBING SCHEDULES.
6. FAN START/STOP VIA RELAY INTERLOCK WITH AIR COMPRESSOR. MAKE FINAL CONNECTIONS.
7. FAN START/STOP VIA BUILDING SCHEDULER. MAKE FINAL CONNECTIONS.
8. DISCONNECT SWITCH SHALL BE PROVIDED WITH EARLY BREAK AUXILARY CONTACTS TO INTERLOCK WITH BOOSTER PUMP VFD. PROVIDE RACEWAY AND CABLING REQUIRED FOR THE INTERLOCKING REQUIREMENT. VFD SHALL START SHUTDOWN PROCESS PRIOR TO FULL DISCONNECT OF SWITCH BLADES.

PANELBOARD 'L1'

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ELEC. 120
LUGS ONLY — MOUNTING: SURFACE; NEMA 1
BUSES: MAIN – 225 A; NEUTRAL – 200%; EQUIPMENT GROUND — Isc = 42,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	0		SPARE	20/1	1	A	2	20/1	RECEP: CONF. 114 – COUNTER	0	1800	
0	0		SPARE	20/1	3	B	4	20/1	RECEP: CONF. 114 – COUNTER	0	1800	
1349	0		LTG: OFFICE AREA/CORRIDOR	20/1	5	C	6	20/1	RECEP: STORAGE 124	0	720	
928	0		LTG: OFFICE AREA/CONFERENCE	20/1	7	A	8	20/1	RECEP: STORAGE 124	0	720	
990	0		LTG: SHOP AREA	20/1	9	B	10	20/1	RECEP: KIT./DINE 125	0	540	
	0	400	LC-1	20/1	11	C	12	20/1	RECEP: KIT./DINE 125 – COUNTER	0	1800	
1186	0		LTG: EXTERIOR BUILDING	20/1	13	A	14	20/1	RECEP: KIT./DINE 125 – COUNTER	0	1800	
0	1080		RECEP: I.T. OFFICE 121	20/1	15	B	16	20/1	RECEP: KIT./DINE 125 – COUNTER	0	1800	
0	1080		RECEP: OFFICE (SAUL) 101	20/1	17	C	18	20/1	RECEP: WRK'ERS POOL 123	0	720	
0	540		RECEP: LOBBY 100	20/1	19	A	20	20/1	RECEP: WRK'ERS POOL 123 – WORKSTATION	0	720	
0	720		RECEP: REC. 102	20/1	21	B	22	20/1	RECEP: WRK'ERS POOL 123 – WORKSTATION	0	720	
0	720		RECEP: REC. 102	20/1	23	C	24	20/1	RECEP: WRK'ERS POOL 123 – WORKSTATION	0	360	
0	900		RECEP: OFFICE 2 103	20/1	25	A	26	20/1	RECEP: WRK'ERS POOL 123 – WORKSTATION	0	360	
0	900		RECEP: DISPATCH 1 104	20/1	27	B	28	20/1	RECEP: WRK'ERS POOL 123 – WORKSTATION	0	360	
0	720		RECEP: DISPATCH 2 112	20/1	29	C	30	20/1	RECEP: WRK'ERS POOL 123 – PLOTTER	0	540	
0	720		RECEP: OFFICE 113	20/1	31	A	32	20/1	RECEP: WRK'ERS POOL 123 – PLOTTER	0	540	
0	540		RECEP: CONF. 114	20/1	33	B	34	20/1	RECEP: GENERAL	0	360	
0	540		RECEP: CONF. 114	20/1	35	C	36	20/1	RECEP: CORRIDOR 111/115, ELEC. 120	0	900	
0	900		RECEP: CONF. 114 – TABLE	20/1	37	A	38	20/1	RECEP: CORRIDOR 110	0	540	
0	900		RECEP: CONF. 114 – TABLE	20/1	39	B	40	20/1	RECEP: WATER COOLER	0	540	
0	360		RECEP: RESTROOMS	20/1	41	C	42	20/1	PWR: F.A.C.P.	0	180	
0	900		RECEP: CONF. 114 – TABLE	20/1	37	A	38	20/1	RECEP: CORRIDOR 110	0	540	
0	900		RECEP: CONF. 114 – TABLE	20/1	39	B	40	20/1	RECEP: WATER COOLER	0	540	
0	360		RECEP: RESTROOMS	20/1	41	C	42	20/1	PWR: F.A.C.P.	0	180	
0	0		SPARE	20/1	43	A	44	20/1	SPARE	0	0	
0	0		SPARE	20/1	45	B	46	20/1	SPARE	0	0	
0	0		SPARE	20/1	47	C	48	20/1	SPARE	0	0	
0	0		SPARE	20/1	49	A	50	20/1	SPARE	0	0	
0	0		SPARE	20/1	51	B	52	20/1	SPARE	0	0	
0	0		SPARE	20/1	53	C	54	20/1	SPARE	0	0	
0	0		SPARE	20/1	55	A	56	20/1	SPARE	0	0	
0	0		SPARE	20/1	57	B	58	20/1	SPARE	0	0	
0	0		SPARE	20/1	59	C	60	20/1	SPARE	0	0	
0	0		SPARE	20/1	61	A	62	30/3	SPD	0	0	
0	0		SPARE	20/1	63	B	64	–	*	0	0	
0	0		SPARE	20/1	65	C	66	–	*	0	0	

VA:L (LIGHTING)	4453	CONNECTED	5566 DEMAND
VA:R (RECEPTACLES)	31860	CONNECTED	20930 DEMAND
VA:O (OTHER)	400	CONNECTED	400 DEMAND
VA: TOTAL	36713	CONNECTED	26896 DEMAND
AMPS: TOTAL	102	CONNECTED	75 DEMAND

L	R	O		TOTAL			
2114	10980	0	VA CONNECTED TO A PHASE	13094	VA =	109	AMPS CONNECTED TO A PHASE @ 120 VOLTS
990	11700	0	VA CONNECTED TO B PHASE	12690	VA =	106	AMPS CONNECTED TO B PHASE @ 120 VOLTS
1349	9180	400	VA CONNECTED TO C PHASE	10929	VA =	91	AMPS CONNECTED TO C PHASE @ 120 VOLTS
4453	31860	400	TOTAL	36713	VA		

PANELBOARD 'L2'

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ELEC. 120
LUGS ONLY — MOUNTING: SURFACE; NEMA 1
BUSES: MAIN – 225 A; NEUTRAL – 200%; EQUIPMENT GROUND — Isc = 42,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	1260		RECEP: OFFICE (BERT) 105	20/1	1	A	2	20/1	ROADWAY GATE OPERATORS	0	0	800
0	360		RECEP: STO. 106	20/1	3	B	4	20/1	ROADWAY GATE OPERATORS	0	0	800
0	900		RECEP: MEN 109	20/1	5	C	6	20/1	ROADWAY GATE OPERATORS	0	0	800
0	900		RECEP: WOMEN 108	20/1	7	A	8	20/1	ROADWAY GATE OPERATORS	0	0	800
0	360		RECEP: SAFE 126A/STO. 126B	20/1	9	B	10	20/2	LTG: PARKING LOT	495	0	
0	1080		RECEP: MECH. SHOP 126	20/1	11	C	12	–	*	495	0	
0	1080		RECEP: MECH. SHOP 126	20/1	13	A	14	20/1	RECEP: GARAGE EXTERIOR	0	720	
0	1080		RECEP: MECH. SHOP 126	20/1	15	B	16	20/1	RECEP: GARAGE EXTERIOR	0	720	
0	360		RECEP: MEZZANINE	20/1	17	C	18	20/1	RECEP: GARAGE EXTERIOR	0	720	
0	0	1296	RECEP: ICE MACHINE	20/1	19	A	20	20/1	RECEP: OFFICE EXTERIOR	0	360	
0	0		SPD	30/3	21	B	22	20/1	RECEP: MEZZANINE	0	360	
0	0		*	–	23	C	24	20/1	RECEP: IRRIGATION CONTROLLER	0	360	
0	0		*	–	25	A	26	20/1	RECEP: I.T. 122	0	180	
0	0	1800	IWH-7	30/2	27	B	28	20/1	RECEP: I.T. 122	0	180	
0	0	1800	*	–	29	C	30	20/1	RECEP: I.T. 122	0	180	
0	0	1800	IWH-8	30/2	31	A	32	20/1	RECEP: I.T. 122 – QUAD	0	360	
0	0	1800	*	–	33	B	34	20/1	RECEP: I.T. 122 – QUAD	0	360	
0	0	8650	IWH-9	110/2	35	C	36	20/2	LTG: PARKING LOT	865	0	
0	0	8650	*	–	37	A	38	–	*	865	0	
0	0	3750	IWH-10	50/2	39	B	40	20/2	LTG: PARKING LOT	865	0	
0	0	3750	*	–	41	C	42	–	*	865	0	

VA:L (LIGHTING)	4450	CONNECTED	5563 DEMAND
VA:R (RECEPTACLES)	11880	CONNECTED	10940 DEMAND
VA:O (OTHER)	36496	CONNECTED	36496 DEMAND
VA: TOTAL	52826	CONNECTED	52999 DEMAND
AMPS: TOTAL	147	CONNECTED	147 DEMAND

L	R	O		TOTAL			
865	4860	13346	VA CONNECTED TO A PHASE	19071	VA =	159	AMPS CONNECTED TO A PHASE @ 120 VOLTS
1360	3420	8150	VA CONNECTED TO B PHASE	12930	VA =	108	AMPS CONNECTED TO B PHASE @ 120 VOLTS
2225	3600	15000	VA CONNECTED TO C PHASE	20825	VA =	174	AMPS CONNECTED TO C PHASE @ 120 VOLTS
4450	11880	36496	TOTAL	52826	VA		

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SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0282
FAX (956) 664-0282
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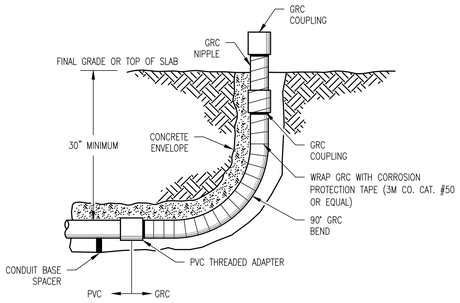
STATE OF TEXAS
GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
11-6-2020

Project No.:	32885.001
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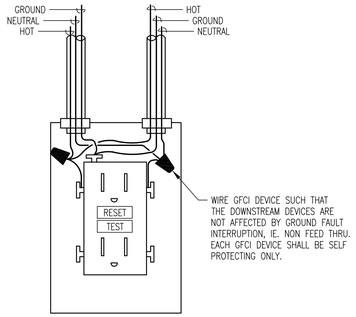
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ELECTRICAL SCHEDULES

E303
Sheet Number

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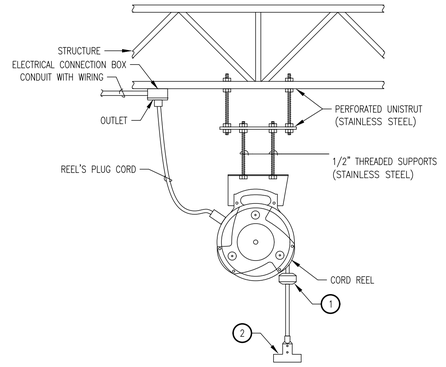
05 TYPICAL CONDUIT STUB-UP DETAIL
N.T.S.



03 GFCI RECEPTACLE - WIRING DIAGRAM
N.T.S.

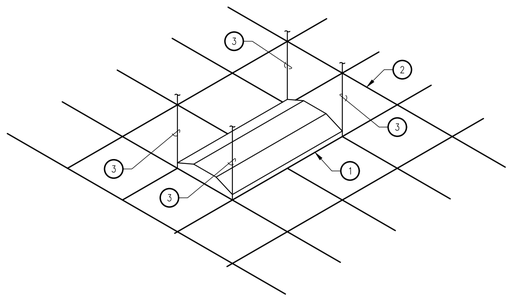
KEY NOTES: (1)

1. ADJUST CORD STOP TO PROVIDE SPECIFIED HEIGHT OF RECEPTACLE END OF CORD.
2. RECEPTACLE END OF CORD SHALL BE AT A HEIGHT OF 7'-0" AFF.



FOR REFERENCE ONLY. THE CONTRACTOR SHALL ADD ADDITIONAL SUPPORTS AND FASTENERS TO PROVIDE WITH A STURDY MOUNTING SYSTEM

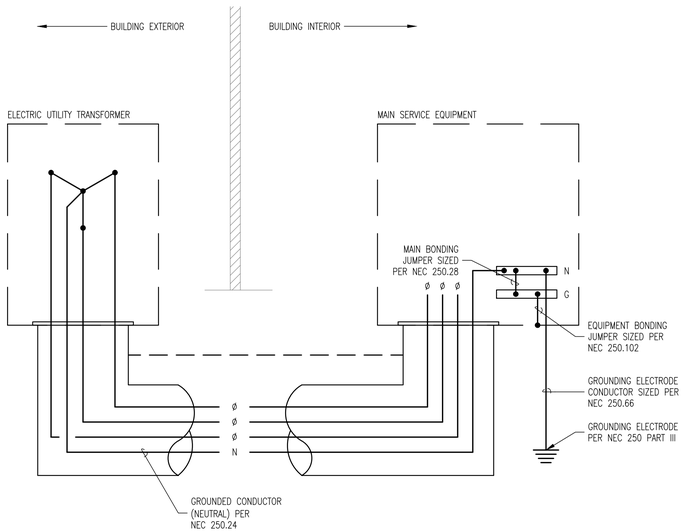
01 CORD REEL DETAIL - NO CEILING
N.T.S.



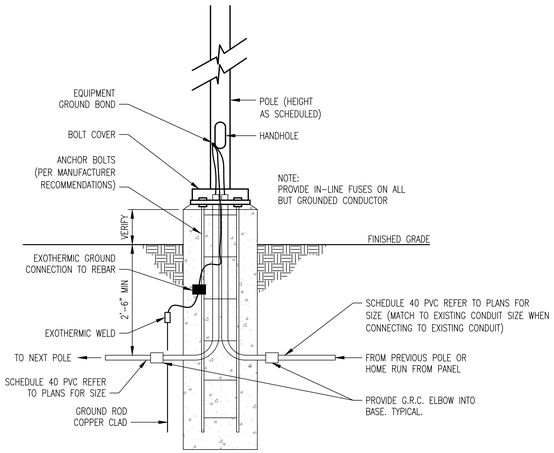
NOTES BY SYMBOL "(#)"

1. 2'x4' LAY-IN LED FIXTURE
2. SUSPENDED CEILING
3. TIE WIRE, CONNECT TO ALL FOUR CORNERS OF FIXTURE TO STRUCTURE ABOVE, INDEPENDENT OF CEILING SUPPORTS.

06 TYPICAL LAY-IN FIXTURE SUPPORT
N.T.S.



SERVICE ENTRANCE (MAIN SWITCHBOARD) GROUNDING DETAIL
04
N.T.S.



NOTE:
POLE BASE SHOWN FOR ELECTRICAL REFERENCE ONLY. REFER TO STRUCTURAL DRAWINGS FOR POLE CONSTRUCTION

02 ELECTRICAL POLE BASE DETAIL
N.T.S.

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SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0282
FAX (956) 664-0282
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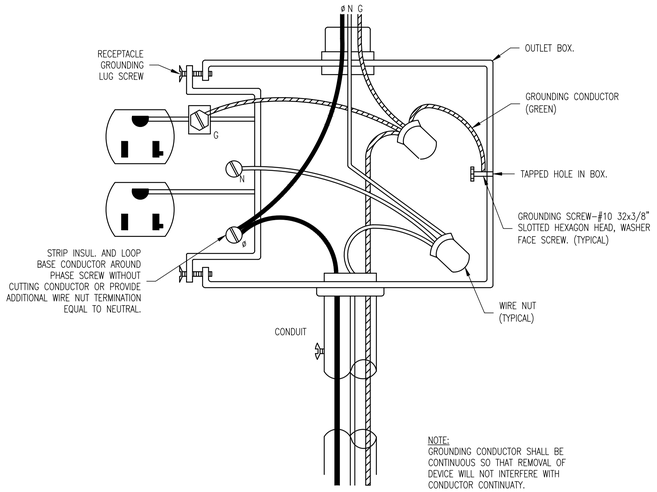
STATE OF TEXAS
GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
11-6-2020

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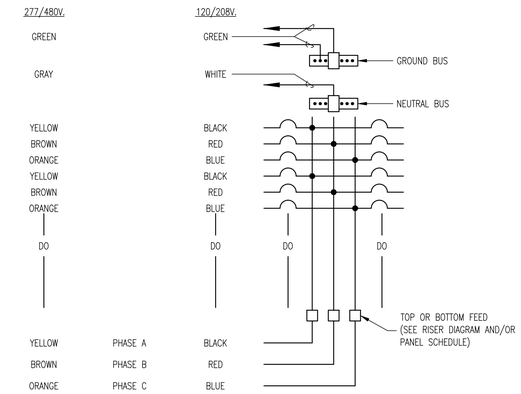
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ELECTRICAL DETAILS

E401
Sheet Number

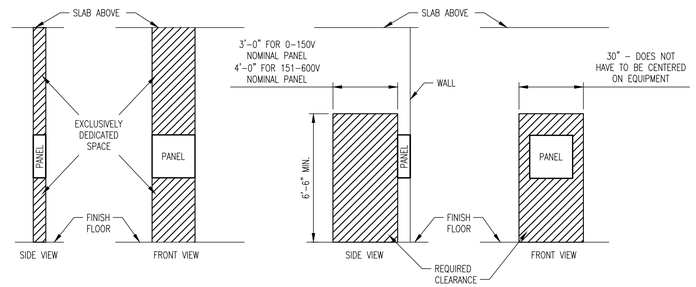
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03 TYPICAL RECEPTACLE GROUNDING DETAIL
N.T.S.



01 TYPICAL PANEL COLOR CODE
N.T.S.



02 TYPICAL PANELBOARD REQUIRED CLEARANCE
N.T.S.

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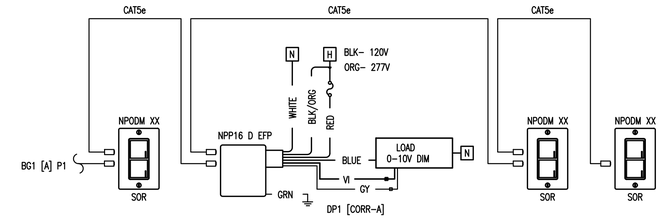
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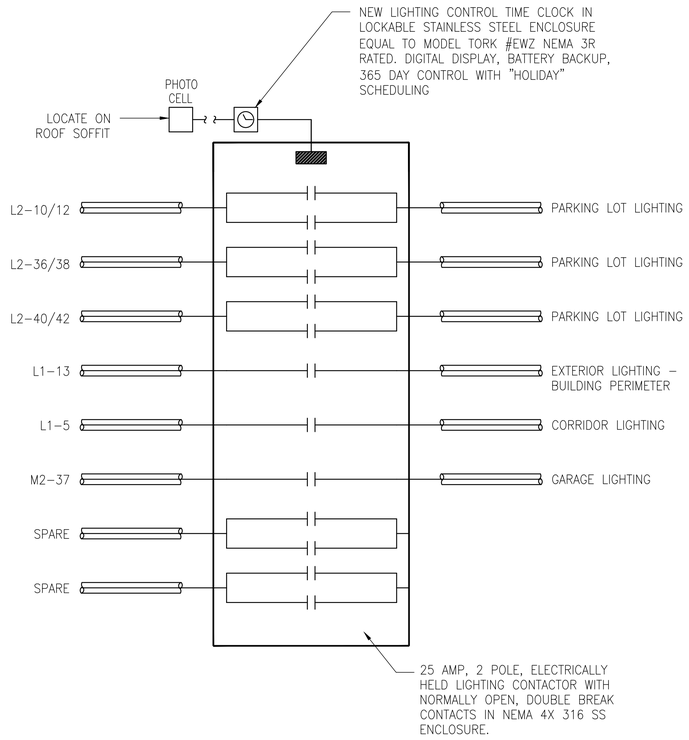
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E402
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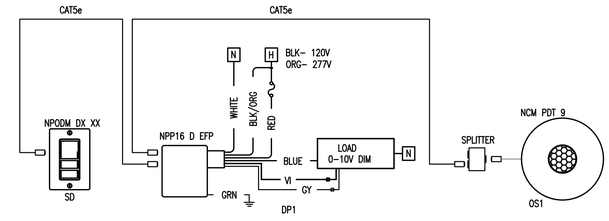
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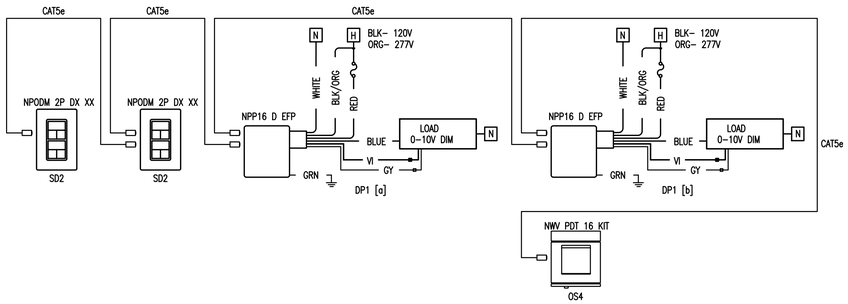
01 CORRIDOR CONTROL WIRING DIAGRAM
N.T.S.



04 LIGHTING CONTACTOR SCHEMATIC - LC-1
N.T.S.



TYPICAL OFFICE - SINGLE ZONE DIMMING WITH OCCUPANCY CONTROL WIRING DIAGRAM
02 DIAGRAM
N.T.S.



TYPICAL CONFERENCE ROOM DUAL ZONE DIMMING AND OCCUPANCY CONTROL WIRING DIAGRAM
03
N.T.S.

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HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
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Sheet Title
LIGHTING CONTROL DETAILS

E403
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TELECOMMUNICATIONS LEGEND

ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION	MNTG. HT. UNO
	TELECOMMUNICATIONS DEVICES/EQUIPMENT	
▷	JUNCTION BOX FOR DATA OUTLET BACK BOX. WALL MOUNTED – STUB 1" CONDUIT ABOVE ACCESSIBLE CEILING. COORDINATE WITH ARCHITECT AND OWNER FOR EXACT LOCATIONS.	15"AFF
▶	JUNCTION BOX FOR TELEPHONE OUTLET. WALL MOUNTED – STUB 3/4" CONDUIT ABOVE ACCESSIBLE CEILING	15"AFF
(▶)	JUNCTION BOX FOR FLOOR MOUNTED DATA/TELEPHONE OUTLET – FLUSH MOUNTED UNO	48"AFF
(▷)	JUNCTION BOX FOR FLOOR MOUNTED DATA OUTLET – FLUSH MOUNTED UNO	–
(▶)	JUNCTION BOX FOR FLOOR MOUNTED TELEPHONE OUTLET – FLUSH MOUNTED UNO	–
S	JUNCTION BOX FOR SPEAKER, WALL MOUNTED	–
(S)	JUNCTION BOX FOR SPEAKER, CEILING MOUNTED	–
(M)	JUNCTION BOX FOR MICROPHONE OUTLET	–
(C) (C) DBL	JUNCTION BOX FOR CLOCK – SINGLE OR DOUBLE FACE	96"AFF
(J)	JUNCTION BOX – SIZE AND MOUNTING AS REQUIRED	
CR	JUNCTION BOX FOR ACCESS CONTROL CARD READER – FURNISH AND INSTALL SINGLE GANG BOX 3/4"C. STUB UP ABOVE ACCESS CEILING. COORDINATE WITH ARCHITECT FOR EXACT LOCATION.	48"AFF
K	JUNCTION BOX FOR ALARM KEYPAD – FURNISH AND INSTALL SINGLE GANG BOX 3/4"C. STUB UP ABOVE ACCESS CEILING. COORDINATE WITH ARCHITECT FOR EXACT LOCATION.	48"AFF
▭◁	JUNCTION BOX FOR CCTV CAMERA – ROUGH-IN ONLY. COORDINATE WITH ARCHITECT FOR EXACT LOCATION.	–
(AP)	JUNCTION BOX FOR WIRELESS ACCESS POINT – PROVIDE DATA DROP AT THIS LOCATION. PROVIDE 10FT OF DATA WIRE SLACK FOR FIELD ADJUSTMENTS.	–
▭	JUNCTION BOX FOR TELEPHONE BOARD – COVER ENTIRE SURFACE OF WALL WITH 3/4" PLYWOOD AND PAINT WITH (2) COATS OF FIRE RETARDANT PAINT. PAINT COLOR SHALL BE WHITE. MOUNT PLYWOOD 8" AFF TO AVOID DAMAGING THE PLYWOOD. INSTALL PLYWOOD WITH THE GRADE 'A' SURFACE EXPOSED.	–
◉	JUNCTION BOX FOR INTERCOM	48"AFF
B	JUNCTION BOX FOR BELL	48"AFF
◁	JUNCTION BOX FOR BUZZER	48"AFF
TV	JUNCTION BOX FOR TELEVISION PROVIDE • QTY(1) – DATA OUTLET (1"C FROM A/V BACK BOX TO PLENUM) • QTY(1) – RG6 OUTLET (1"C FROM A/V BACK BOX TO PLENUM) • QTY(2) – A/V J-BOX – BASIS OF DESIGN: FSR PWB-2X0-AVBB • QTY(1) – IPS VIDEO INSERT – BASIS OF DESIGN: FSR IPS-V911S • QTY(2) – IPS DATA INSERT – BASIS OF DESIGN: FSR IPS-D713S • QTY(1) – A/V BACK BOX – BASIS OF DESIGN: FSR PWB-200. PWB-20X-MNT MOUNTING EARS, ELECTRICAL BOXES, FACE PLATES AND REQUIRED ACCESSORIES.	VERIFY MOUNTING HEIGHT WITH ARCHITECT
AVP	JUNCTION BOX FOR AV PROVIDE WITH RECEPTACLE – RAPIDRUN CONNECTORS, FACEPLATES, AND REQUIRED FLYING LEADS TO HAVE: HD15+3.5MM+COMPOSITE VIDEO+STEREO AUDIO+HDMI CONNECTORS.	VERIFY MOUNTING HEIGHT WITH ARCHITECT
AV	JUNCTION BOX FOR AV PROVIDE – RAPIDRUN CONNECTORS, FACEPLATES, AND REQUIRED FLYING LEADS TO HAVE: HD15+3.5MM+COMPOSITE VIDEO+STEREO AUDIO+HDMI CONNECTORS.	VERIFY MOUNTING HEIGHT WITH ARCHITECT
(●) FB1	FLOOR BOX – PROVIDE WITH ACCESSORY PLATES INCLUDING (1) FBMP6KS, (1) FBMPREC. PROVIDE C2G#60150 LEGRAND TRANSMITTER PLATE, CONDUIT TO NEAREST WALL AND EXTEND TO PLENUM SPACE. FOR A/V AND DATA CONDUIT, PROVIDE EACH WITH (1) 1-1/2"C WITH PULLSTRINGS. PROVIDE WITH (2) DATA DROPS. REFER TO ELECTRICAL LEGEND FOR POWER REQUIERMENTS.	–

TELECOMMUNICATIONS GENERAL NOTES

TELECOMMUNICATIONS PLAN NOTES

A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER SOURCE WIRING IN ACCORDANCE WITH ARCHITECTURAL MILLWORK. ALL INSTALLATIONS SHALL COMPLY WITH ADA REQUIREMENTS.

B. CONTRACTOR SHALL VERIFY ALL REQUIREMENTS BEFORE ANY ROUGH-IN IN ORDER TO COORDINATE MANUFACTURER'S DRAWINGS FOR EQUIPMENT LOCATION AND INSTALLATION ACCESSORIES.

C. COORDINATE ROUTING FOR CONDUIT UP IN JOIST AND FOR SUSPENDING REQUIREMENTS IN ACCORDANCE WITH STRUCTURAL PLANS.

D. ALL INTERCOM, DATA, AND TV DEVICES SHALL BE STUBBED UP TO ABOVE ACCESSIBLE CEILING AND TO CABLE TRAY IF PRESENT. THE CONTRACTOR SHALL PROVIDE J-HOOKS AND CONDUITS TO EXTEND CABLING TO WALLS.

E. ALL PENETRATIONS THROUGH FIRE RATED WALLS SHALL HAVE SOUND RETARDING/ABSORBING FIRE STOP MATERIAL. PROVIDE WITH ZERO MAINTENANCE, MECHANICAL TYPE FIRE STOP SYSTEM OR EQUAL.

F. CONDUITS SHALL BE REAMED AND COMPLETED WITH CONNECTORS AND INSULATED BUSHINGS AT BOTH ENDS.

G. BETWEEN ANY TWO PULL POINTS THERE SHALL BE NO CONDUIT WITH GREATER THAN 180 DEGREES OF BENDS OR EQUIVALENT.

H. WHERE CONDUIT LENGTH EXCEEDS 100FT AND/OR TWO 90 DEGREE BENDS OR EQUIVALENT PROVIDE PULL BOXES AS REQUIRED.

I. ALL ZONE CONDUITS (HOME RUN) FOR LOW VOLTAGE COMMUNICATIONS CABLING SHALL BE MARKED AT THEIR TERMINUS WITH A TAG THAT IDENTIFIES "DATA, INTERCOM, ETC" (ROOM NAME AND NUMBER) WHERE THE OTHER END OF THE CONDUIT TERMINATES.

J. ALL CABLES ABOVE CEILING SHALL BE PLENUM RATED.

K. FURNISH AND INSTALL 8'H X 4'W X 3/4"T VERTICALLY HUNG, GRADE AC, PLYWOOD IN COMMUNICATION ROOMS AS INDICATED ON PLANS. PAINT PLYWOOD WITH TWO COATS OF FIRE RETARDANT TO MATCH EXISTING WALL FINISH. COORDINATE WITH ARCHITECT, PRIME CONTRACTOR, AND OWNER FOR INSTALLATION OF BACKBOARD. REFER TO DRAWINGS FOR PROPOSED LOCATION AND DETAILS.

L. MINIMUM CONDUIT SIZE FOR TWISTED PAIR CABLING (LOW VOLTAGE) SHALL BE NOT SMALLER THAN 1" TRADE SIZE.

M. THE CONTRACTOR SHALL FULLY REVIEW ALL ELECTRICAL POWER PLANS TO IDENTIFY ALL RESPONSIBILITIES AND SCOPE OF WORK.

N. DO NOT ROUTE FIRE ALARM RELATED CABLING IN SAME CABLE TRAY, AS OTHER LOW VOLTAGE SYSTEMS. UTILIZE DEDICATED J-HOOKS OR CONDUITS FOR ALL FIRE ALARM RELATED CABLING.

O. ABOVE CEILING CABLE SUPPORTING HARDWARE, IN CONJUCTION WITH THE SPECIFIED CABLE TRAY, ACCEPTABLE METHOD INCLUDES BUT IS NOT LIMITED TO J-HOOKS. CABLE SHOULD BE PROPERLY SUPPORTED WITH J-HOOK PATHWAY INSTALLED EVERY 3-5 FT.CABLE CROSS SECTION AREA SHOULD BE CALCULATED TO A 40% RATIO.

P. REFER TO ELECTRICAL PLANS FOR FLOOR BOXES ASSOCIATED WITH FUTURE DATA DROPS.

GENERAL ABBREVIATIONS

ABS	ABOVE BACK SPLASH	EC	EMPTY CONDUIT	IG	ISOLATED GROUND	NO (N.O.)	NORMALLY OPEN	UF	UNDERFLOOR
AFF	ABOVE FINISHED FLOOR	EX	EXISTING	MTD	MOUNT OR MOUNTED	RCPT(S)	RECEPTACLE(S)	UG	UNDERGROUND
ARS	AREA OF RESCUE SYSTEM	F	FUSE	NC (N.C.)	NORMALLY CLOSED	PNL	PANEL	WG	WIRE GUARD
BFC	BELOW FINISHED CEILING	FSD	FIRE & SMOKE DAMPER	NF	NONFUSED	SD	SMOKE DAMPER	WP	WEATHERPROOF
BOCT	BOTTOM OF CABLE TRAY	G	GROUND (EQUIPMENT)	NIC	NOT IN CONTRACT	SO (S.O.)	SPACE ONLY	WP/WIU	WEATHERPROOF WITH WHILE-IN-USE COVER
C	CONDUIT	GAP	GENERATOR ANNUNCIATOR PANEL	TYP	TYPICAL	SP	SPARE	XFMR	TRANSFORMER
CB	CIRCUIT BREAKER	GFI	GROUND FAULT INTERRUPTER	EP	ELECTRICAL PRIMARY	ST (S.T.)	SHUNT TRIP	UNO	UNLESS NOTED OTHERWISE
CLG	CEILING	IC	INTERRUPTING CAPACITY	NL	NIGHT LIGHT	SW	SWITCH		

NOTES:
1. 48" AFF INDICATES TO TOP OF DEVICE;
   15" AFF INDICATES TO BOTTOM OF DEVICE;
   ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0202
FAX (956) 664-0282
TBPE FIRM #F-312

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STATE OF TEXAS
GABRIEL BENAVIDES JR.
119255
LICENSED
PROFESSIONAL ENGINEER
11-6-2020

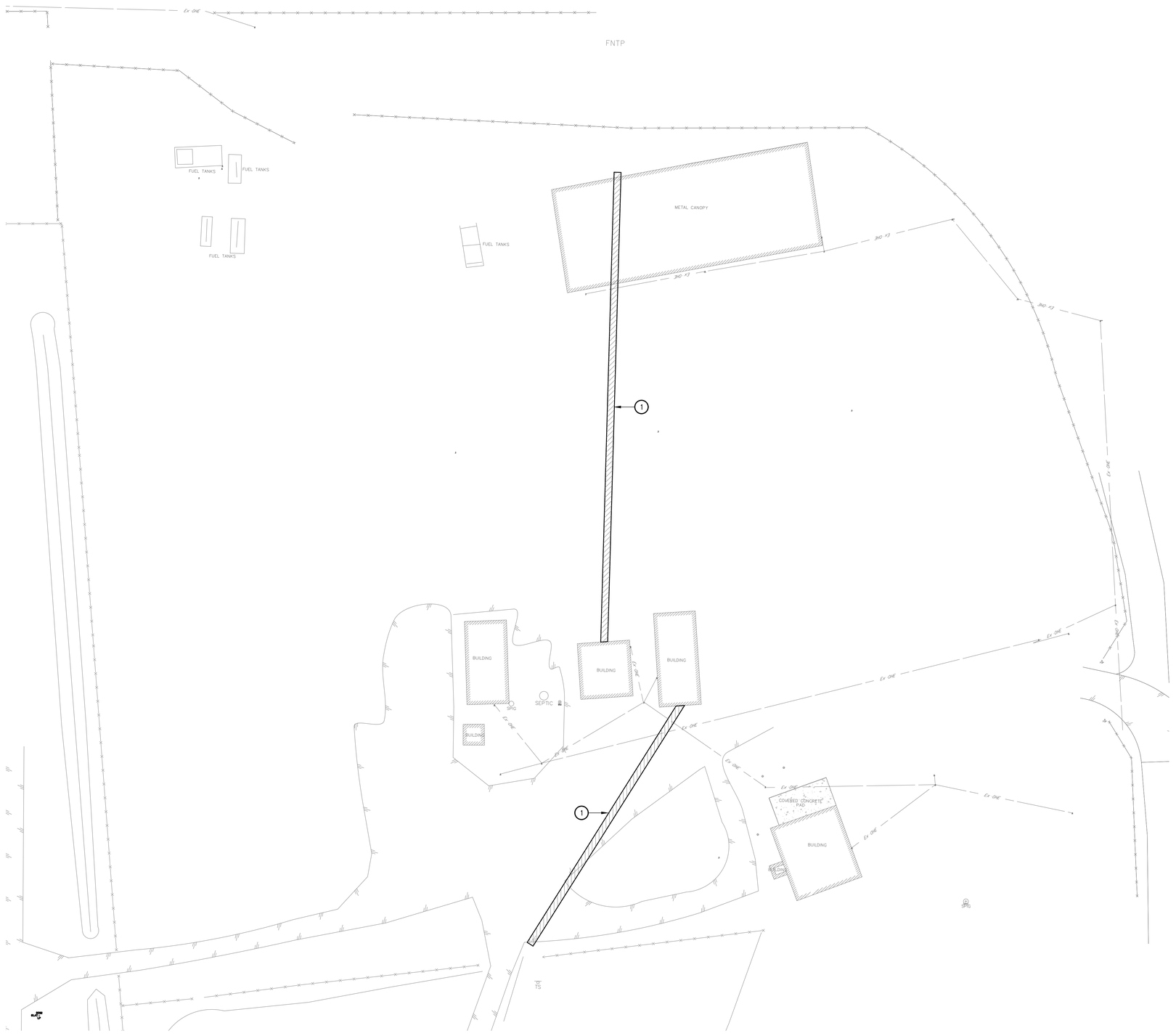
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Jose Delgado
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TELECOMMUNICATIONS GENERAL LEGEND

TN001
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GENERAL NOTES:

1. REFER TO SHEET TN001 GENERAL NOTES.

KEY NOTES: (1)

1. CONTRACTOR TO COORDINATE EXISTING UTILITY SERVICE WITH CABLE AND TELEPHONE COMPANIES TO BE REMOVED AND RELOCATED FOR TEMPORARY SERVICE PRIOR TO DEMOLITION.

LEGEND:

EXISTING UNDERGROUND TELEPHONE AND CABLE TV TO BE DEMOLISHED

01 DEMOLITION TELECOMMUNICATIONS SITE PLAN

SCALE: 1"=30'

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-2020
FAX (956) 664-2282
TBPE FIRM #F-312

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STATE OF TEXAS
GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
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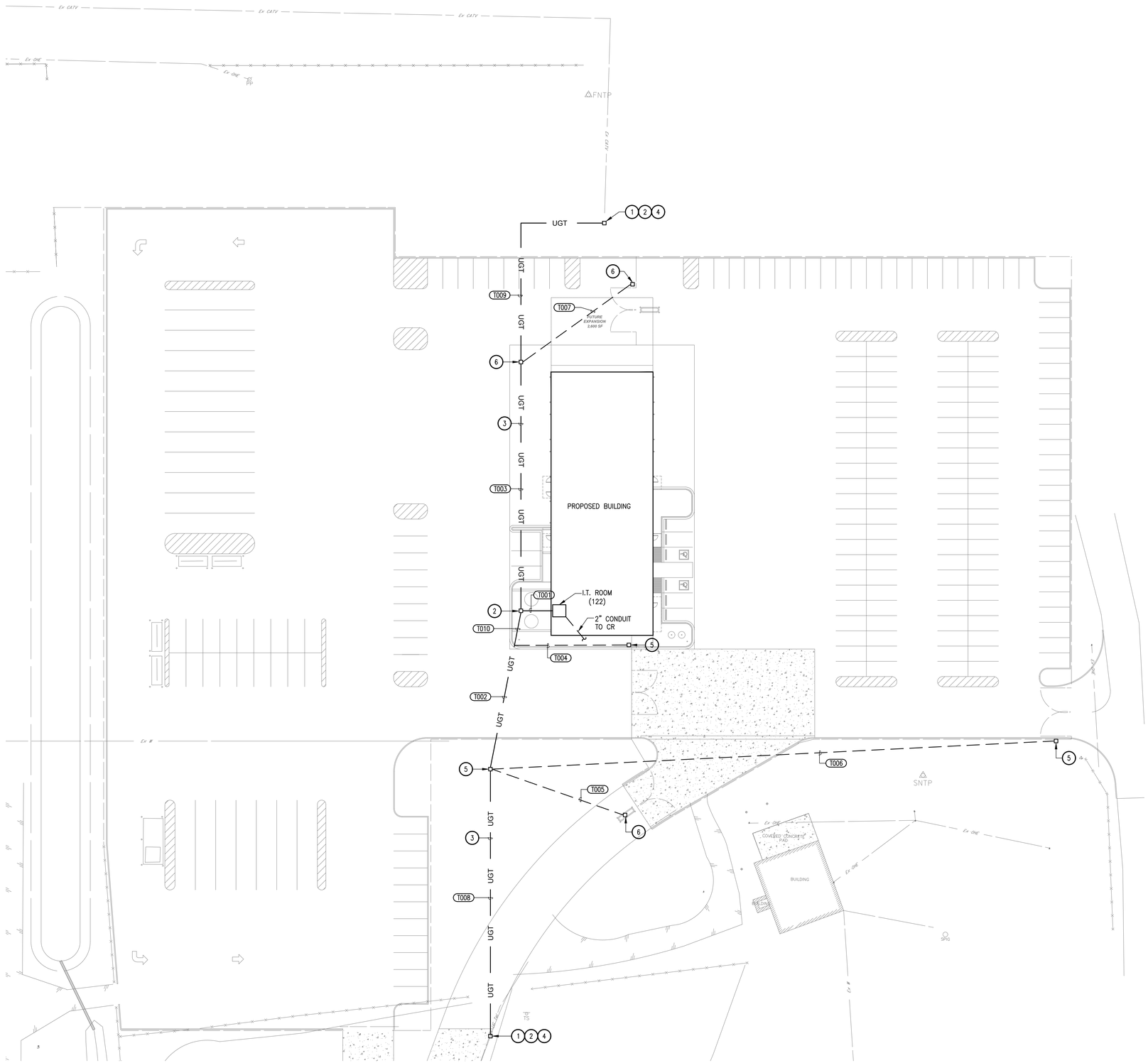
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EXISTING TELECOMMUNICATIONS SITE PLAN

TN101

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01 TELECOMMUNICATIONS SITE PLAN
SCALE: 1"=30'

GENERAL NOTES:

1. REFER TO SHEET TN001 GENERAL NOTES.

KEY NOTES:

1. COORDINATE WITH OWNER FOR LOCATION OF EXISTING UNDERGROUND UTILITY SERVICES. REFER TO CIVIL PLANS FOR ADDITIONAL REQUIREMENTS.
2. OLDCASTLE H-SERIES POLYMER #4848 WITH TIER 15 COVER.
3. COORDINATE WITH OTHER UTILITIES FOR DUCTBANK DEPTH. REFER TO CIVIL DRAWINGS FOR MORE INFORMATION.
4. CONTRACTOR TO COORDINATE WITH OWNER, TELEPHONE AND CABLE COMPANIES TO RESTORE PERMANENT SERVICE TO FACILITIES AFTER CONSTRUCTION IS COMPLETE.
5. OLDCASTLE SYNERTECH DUO 12X12 WITH TIER 15 COVER FOR GATE CONTROLS ACCESS CONTROL COMMUNICATIONS.
6. OLDCASTLE CHRISTY B1017 10X17 FOR GATE CONTROLS ACCESS CONTROL COMMUNICATIONS.

LEGEND:

UGT	NEW DUCTBANK FOR UNDERGROUND TELECOMMUNICATION CONDUIT
Ex UG Tel	EXISTING UNDERGROUND TELEPHONE
Ex CATV	EXISTING UNDERGROUND CABLE TV

TELECOMMUNICATIONS RACEWAY SCHEDULE

TAG	REMARKS
T001	(1) 4"C FOR FIBER (1) 4"C FOR COPPER (2) 4"C SPARE (4) 2"C TELECOMMUNICATION (1) 4"C COAXIAL FOR CATV
T002	(1) 4"C FOR FIBER (1) 4"C FOR COPPER (1) 4"C SPARE (2) 2"C TELECOMMUNICATION
T003	(1) 4"C COAXIAL FOR CATV (1) 4"C SPARE (1) 2"C TELECOMMUNICATION
T004	(1) 2"C TELECOMMUNICATION
T005	(1) 2"C TELECOMMUNICATION
T006	(1) 2"C TELECOMMUNICATION
T007	(1) 2"C TELECOMMUNICATION
T008	(1) 4"C FOR FIBER (1) 4"C FOR COPPER (1) 4"C SPARE
T009	(1) 4"C SPARE (1) 4"C COAXIAL FOR CATV
T010	(1) 4"C FOR FIBER (1) 4"C FOR COPPER (1) 4"C SPARE (3) 2"C TELECOMMUNICATION

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HALFF
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MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
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TELECOMMUNICATIONS SITE PLAN

TN102
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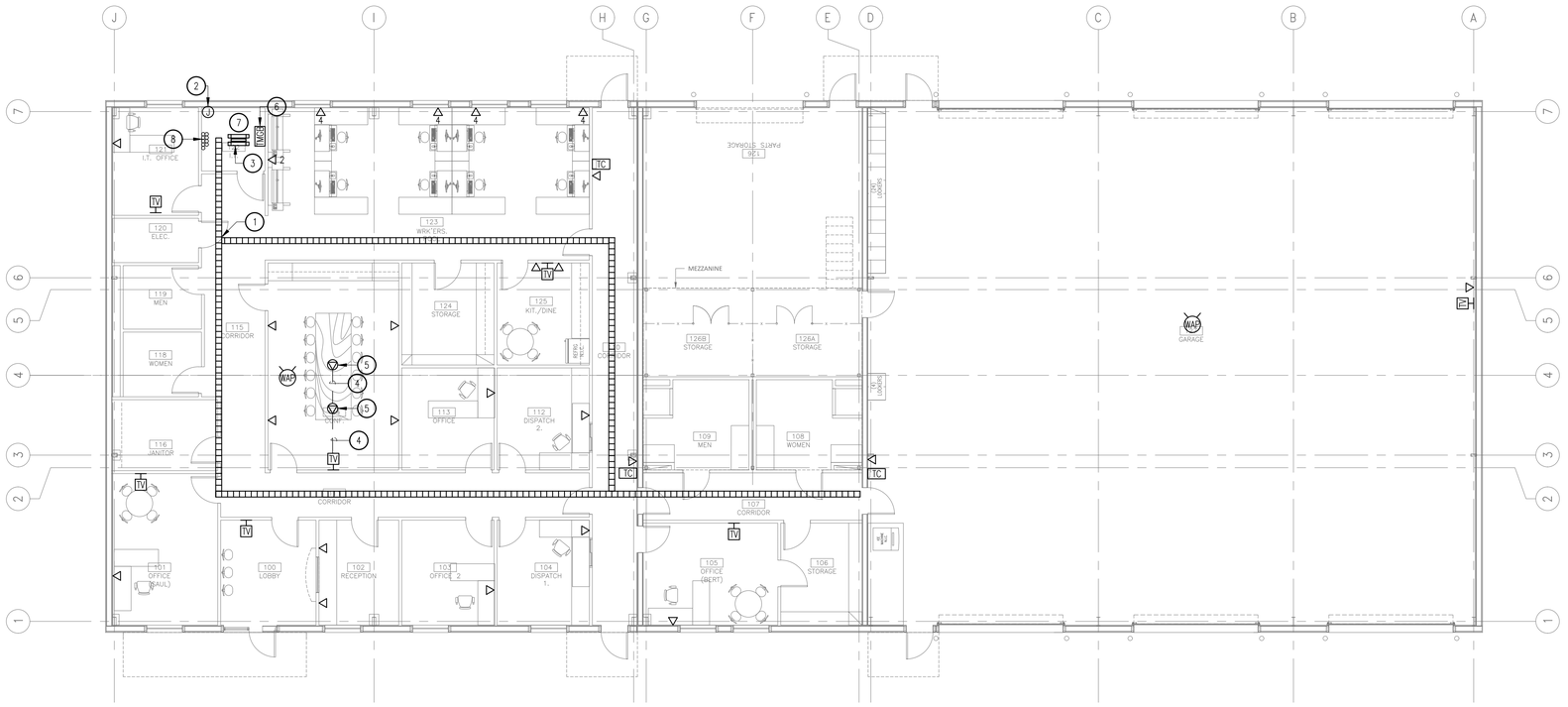
A. REFER TO SHEET TN001 GENERAL NOTES.

B. PROVIDE WITH 1" CONDUIT TO ROUTE TELECOMMUNICATION AND SECURITY DATA CABLING AT OPEN TO STRUCTURE CEILINGS.

C. CONTRACTOR SHALL USE ZERO MAINTENANCE MECHANICAL TYPE FIRE STOP SYSTEM AT ALL FIRE RATED WALL PENETRATIONS.

KEY NOTES: (1)

1. TYPICAL FOR ALL. BASKET TYPE 4"X12" WIRE CABLE TRAY AT 11'-0" ABOVE FINISH FLOOR IN ACCESSIBLE PLENUM SPACE.
2. LOW VOLTAGE CONTRACTOR TO PROVIDE NEW PATHWAY FOR CATV CONNECTIVITY WITH SATELLITE ANTENNA AT BUILDING ROOFTOP. REFER TO ARCHITECT PLANS FOR ROOFTOP PENETRATION DETAILS.
3. PROVIDE WITH WATERFALL TYPE TRAY. REFER TO DETAILS FOR ELEVATIONS, BONDING AND GROUNDING INFORMATION.
4. PROVIDE WITH (2) 1"C ONE FOR DATA FROM FLOOR BOX TO PLENUM SPACE AND ANOTHER FOR A/V BOX TO TV BACK BOX.
5. FURNISH AND INSTALL FLOOR BOX CFB4G30ROR WITH ROUND COVER, FBMPREC, FBMP6KS COVERS. FOR POWER RECEPTACLE TYPES, REFER TO ELECTRICAL PLANS.
6. PROVIDE WITH WALL MOUNTED TMGB BY NETWORK RACK. REFER TO DETAILS FOR MORE INFORMATION.
7. COVER SURFACE OF WALL WITH ¾" PLYWOOD AND PAINT WITH (2) COATS OF FIRE RETARDANT PAINT – PAINT COLOR SHALL BE WHITE. MOUNT PLYWOOD 8" AFF TO AVOID DAMAGING THE PLYWOOD. INSTALL PLYWOOD WITH GRADE 'A' SURFACE EXPOSED.
8. APPROXIMATE LOCATION OF CONDUITS FOR TELECOMMUNICATION CABLING. EXTEND CONDUITS 3" AFF AND LABEL "FOR TELECOMMUNICATIONS". COORDINATE WITH OWNER FOR EXACT LOCATION.



01 TELECOMMUNICATIONS PLAN

SCALE: 1/8" = 1'-0"

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 687-0080
FAX (956) 994-0282
TBPE FIRM #F-312

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GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
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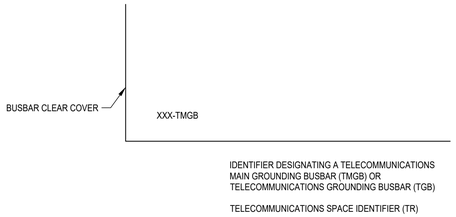
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TELECOMMUNICATIONS PLAN

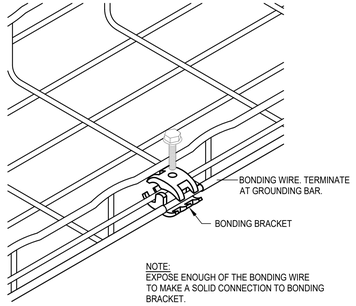
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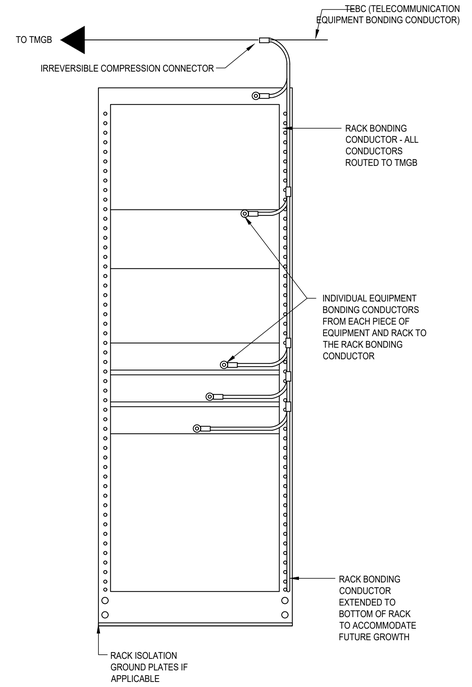
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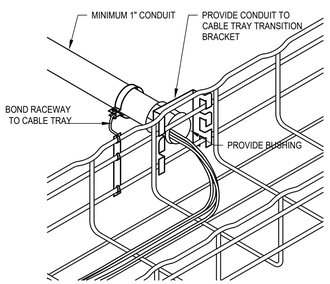
06 GROUNDING BUSBAR LABEL DETAIL
SCALE: 1:1



04 CABLE TRAY GROUNDING DETAIL
N.T.S.



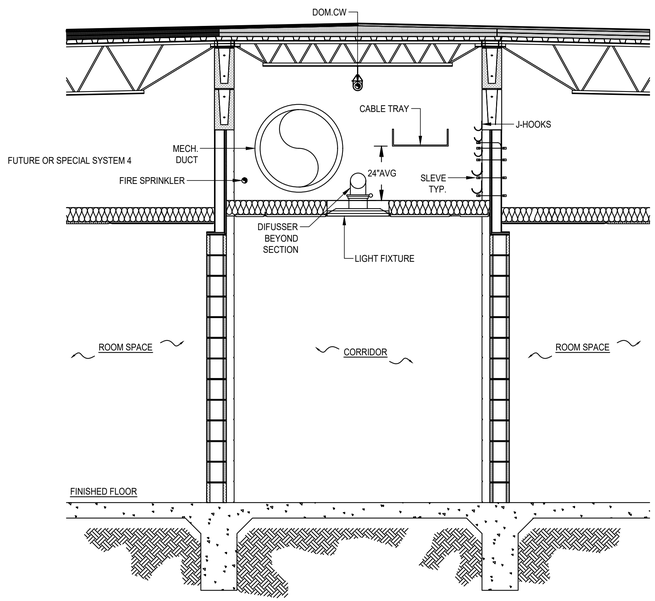
02 RACK-ENCLOSURE BONDING DETAIL
N.T.S.



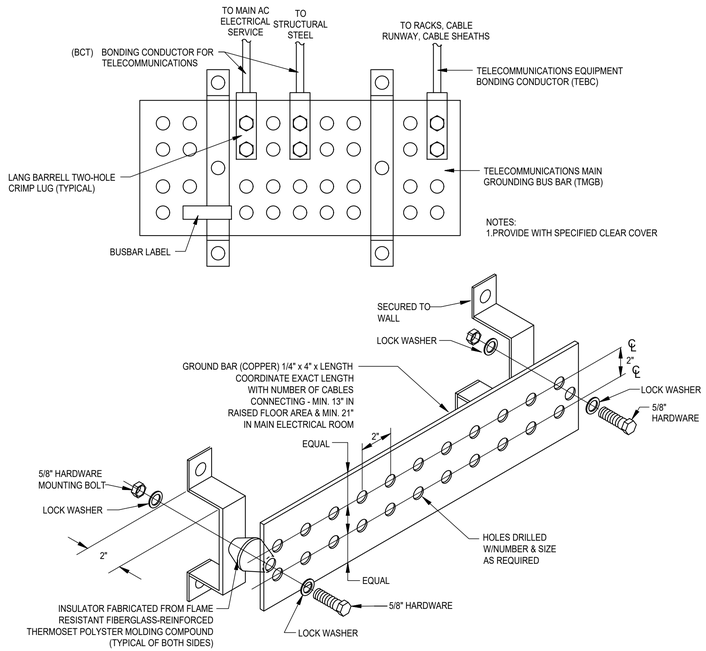
05 CONDUIT AT CABLE TRAY DETAIL - BASKET
N.T.S.

GENERAL NOTES:

A. IT DEPARTMENT IS RESPONSIBLE OF ALL SUB CONTRACTORS TO COORDINATE WITH TRADES AND PROVIDE CLEARANCES REQUIRED FOR CABLE TRAY AND J-HOOKS.



03 TYPICAL J-HOOK INSTALLATION DETAIL
N.T.S.



01 WALL MOUNTED TMGB DETAIL
N.T.S.

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HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
TBPE FIRM #F-312

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GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
11-6-2020

REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER
Bicsi
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FIRE ALARM LEGEND

FIRE ALARM

ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
M	DOOR HOLDER OR DOOR RELEASE	–
F	FIRE ALARM PULL STATION	48" AFF
F	FIRE ALARM AUDIBLE/VISUAL SIGNAL	88" AFF
F WP	FIRE ALARM AUDIBLE/VISUAL SIGNAL WEATHERPROOF – THE EXTERIOR AUDIO VISUAL DEVICE SHALL BE FURNISHED AND INSTALLED WITH A PROTECTIVE WIRE GUARD. THE DEVICE SHALL BE ACTIVATED WHEN THE FLOW TAMPER AND/OR PRESSURE SWITCHES ARE ACTIVATED.	88" AFF
F	FIRE ALARM AUDIBLE SIGNAL	88" AFF
F	FIRE ALARM VISUAL SIGNAL	88" AFF
S	FIRE ALARM AUDIBLE/VISUAL SIGNAL – VOICE EVAC	88" AFF
S	FIRE ALARM SPEAKER – VOICE EVAC	88" AFF
FS	FIRE ALARM SPRINKLER FLOW SWITCH	–
TS	FIRE ALARM SPRINKLER TAMPER SWITCH	–
S	FIRE ALARM SMOKE DETECTOR CEILING OR WALL MOUNTED	88" AFF
H	HEAT DETECTOR CEILING OR WALL MOUNTED	–
D	DUCT SMOKE DETECTORS	–
FACP	FIRE ALARM CONTROL PANEL – FURNISH AND INSTALL THE FOLLOWING: SPD HUBBELL #HBLSDSA40. MOUNT SPD WITHIN 12" OF PANEL, NETWORK INTERFACE CARD, COMMERCIAL FIRE ALARM DUAL PATH CELLULAR COMMUNICATOR MODULE, AND FIBER OPTIC MEDIA MODULE. PANEL SHALL BE CONNECTED TO LAN.	–
FAAP	FIRE ALARM ANNUNCIATOR PANEL	–
FADC	WALL MOUNTED SYSTEM RECORD DOCUMENTS CABINET.COMPLY WITH ARTICLE 7.7–RECORDS, RECORD RETENTION, AND RECORD MAINTENANCE OF NFPA 72.	–
◀2	PROVIDE (2) TELEPHONE CONNECTIONS FOR FACP. FURNISH AND INSTALL TELEPHONE OUTLET AT PANEL.	–

FIRE ALARM GENERAL NOTES

A. CONDUIT OR WIRING ROUTING SHOWN ON PLANS IS DIAGRAMATIC. THE CONTRACTOR SHALL COORDINATE EXACT LOCATION OF CONDUIT, WIRING, AND DEVICES WITH EXISTING BUILDING ELEMENTS AND THE WORK OF OTHER TRADES.
B. REFER TO FIRE ALARM LEGEND ON THIS SHEET FOR MOUNTING HEIGHT OF DEVICES.
C. ALL FIRE ALARM DEVICES SHALL BE STUBBED UP ABOVE ACCESSIBLE CEILING AND ROUTE THROUGH CORRIDOR TO FACP.
D. ALL PENETRATIONS THROUGH FIRE RATED WALLS SHALL HAVE SOUND RETARDING/ABSORBING FIRE STOP MATERIAL.
E. PROVIDE WITH DUCT SMOKE DETECTORS FOR SUPPLY AND RETURN DUCTS. REFER TO MECHAINCAL PLANS FOR EXACT LOCATION.
F. ALL DEVICES SHOWN ON DRAWINGS ARE SYMBOLIC ONLY. THE ENTIRE FIRE ALARM SYSTEM SHALL BE IN FULL COMPLIANCE AND MEET ALL CODES AND REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION. SUBMIT THROUGH HIDALGO COUNTY FIRE MARSHALL'S OFFICE.
G. THE FIRE ALARM CONTRACTOR SHALL INSTALL AT A MINIMUM THE DEVICES SHOWN ON PLANS, NO EXCEPTIONS. HE/SHE SHALL SUBMIT DRAWINGS TO AUTHORITY HAVING JURISDICTION FOR REVIEW.
H. RECESS CONDUIT STUBUPS WHERE POSSIBLE. PROVIDE WIREMOLD LEGRAND 700 SERIES RACEWAY WHERE SURFACE MOUNTED RACEWAYS ARE REQUIRED.
I. THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL COST ASSOCIATED TO THE EXTENSION OF ALL CIRCUITS REQUIRED FOR FIRE ALARM PANELS, POWER SUPPLIES, ETC..
J. FOR ALL DEVICES SHOWN ON WALLS REQUIRING CONDUIT OR SURFACE RACEWAY, THE CONTRACTOR SHALL PROVIDE WITH ALL REQUIRED ROUGH–INS FROM WALL TO PLENUM SPACE FOR INSTALLATION OF DEVICES.
K. THE CONTRACTOR SHALL WEATHER AND FIRE SEAL WALL PENETRATIONS WHERE CABLING IS ROUTED.
L. ALL CABLING INSIDE BUILDING SHALL BE PLENUM RATED TYPE.
M. FOR ALL CEILING MOUNTING DEVICES PROVIDE DRYWALL CEILING BOX EQUAL TO CAM–LIGHT BOX #FL430, BY ARLINGTON.
N. ALL FIRE ALARM WIRING IN OPEN TO STRUCTURE SPACES SHALL BE ROUTED IN CONDUIT. CONCEAL CONDUIT TO WALL AS MUCH AS POSSIBLE.
O. DO NOT ROUTE FIRE ALARM RELATED CABLING IN SAME CABLE TRAY,CONDUIT, OR J–HOOKS, AS OTHER LOW VOLTAGE SYSTEMS. ULTILIZE DEDICATED J–HOOKS OR CONDUITS FOR ALL FIRE ALARM RELATED CABING.
P. THE CONTRACTOR SHALL FULLY REVIEW ALL ELECTRICAL POWER PLANS TO IDENTIFY ALL RESPONSIBILITIES AND SCOPE OF WORK.
Q. CONTRACTOR SHALL PROVIDE A PLASTIC ENGRAVED LABEL AT EVERY ROOM'S DOOR THAT HAS A FIRE ALARM POWER SUPPLY OF FIRE ALARM PANELS TYPE OF EQUIPMENT INSIDE SUCH ROOM. THE LABEL SHALL INDICATE THE TYPE OF EQUIPMENT IN THE ROOM. LABEL SHALL BE PLACED AT THE EXTERIOR SIDE OF THE DOOR.
R. THE CONTRACTOR SHALL ENSURE ALL CEILING MOUNTED DEVICES ARE NOT MOUNTED UNDER ANY HVAC'S DRIP PANS.
S. ALL FIRE ALARM CABLING OPEN TO STRUCTURE SPACES SHALL BE RUN IN CONDUIT. CONCEAL CONDUIT AS MUCH AS POSSIBLE. PAINT CONDUIT TO MATCH SURFACE COLOR AND IDENTIFY SUPPORT DEVICE ELECTRICAL BOXES WITH RED PAINT.
T. ALL SECURITY DOORS SHALL BE INTERFACED WITH NEW FIRE ALARM SYSTEM.
U. DOCUMENT FILE CABINET SHALL CONTAIN AS BUILT PLANS, PERMIT OF OCCUPANCY, REPAIR AND MAINTENANCE MANUALS, SOFT COPIES IN FORM OF CD'S WITH CLOSEOUT DOCUMENTS AND ORIGINAL PLANS WITH FIRE MARSHALL'S SEAL.
V. PROVIDE WITH SURGE PROTECTION DEVICES TO PROTECT EACH END OF ROUTING BETWEEN BUILDINGS.
W. CONTRACTOR SHALL LABEL ALL FIRE ALARM RELATED EQUIPMENT AND DEVICES FOR PROPER IDENTIFICATION.
X. CONTRACTOR SHALL COORDINATE WITH AHJ FOR EXACT LOCATION OF KNOX BOX AND INCLUDE ALL MATERIALS ON HIS BID, PEDESTAL, LABOR, AND ACCESSORIES.

GENERAL ABBREVIATIONS

ABS	ABOVE BACK SPLASH	EC	EMPTY CONDUIT	IG	ISOLATED GROUND	NO (N.O.)	NORMALLY OPEN
AFF	ABOVE FINISHED FLOOR	EX	EXISTING	MTD	MOUNT OR MOUNTED	RCPT(S)	RECEPTACLE(S)
ARS	AREA OF RESCUE SYSTEM	F	FUSE	NC (N.C.)	NORMALLY CLOSED	PNL	PANEL
BFC	BELOW FINISHED CEILING	FSD	FIRE & SMOKE DAMPER	NF	NONFUSED	SD	SMOKE DAMPER
BOCT	BOTTOM OF CABLE TRAY	G	GROUND (EQUIPMENT)	NIC	NOT IN CONTRACT	SO (S.O.)	SPACE ONLY
C	CONDUIT	GAP	GENERATOR ANNUNCIATOR PANEL	TYP	TYPICAL	SP	SPARE
CB	CIRCUIT BREAKER	GFI	GROUND FAULT INTERRUPTER	EP	ELECTRICAL PRIMARY	ST (S.T.)	SHUNT TRIP
CLG	CEILING	IC	INTERRUPTING CAPACITY	NL	NIGHT LIGHT	SW	SWITCH
						UF	UNDERFLOOR
						UG	UNDERGROUND
						WG	WIRE GUARD
						WP	WEATHERPROOF
						WP/WIU	WEATHERPROOF WITH WHILE–IN–USE COVER
						XFMR	TRANSFORMER
						UNO	UNLESS NOTED OTHERWISE

NOTES:
1. 48" AFF INDICATES TO TOP OF DEVICE;
   15" AFF INDICATES TO BOTTOM OF DEVICE;
   ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

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FIRE ALARM GENERAL LEGEND

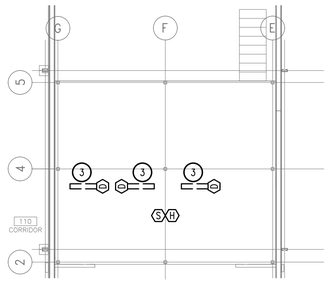
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Sheet Number

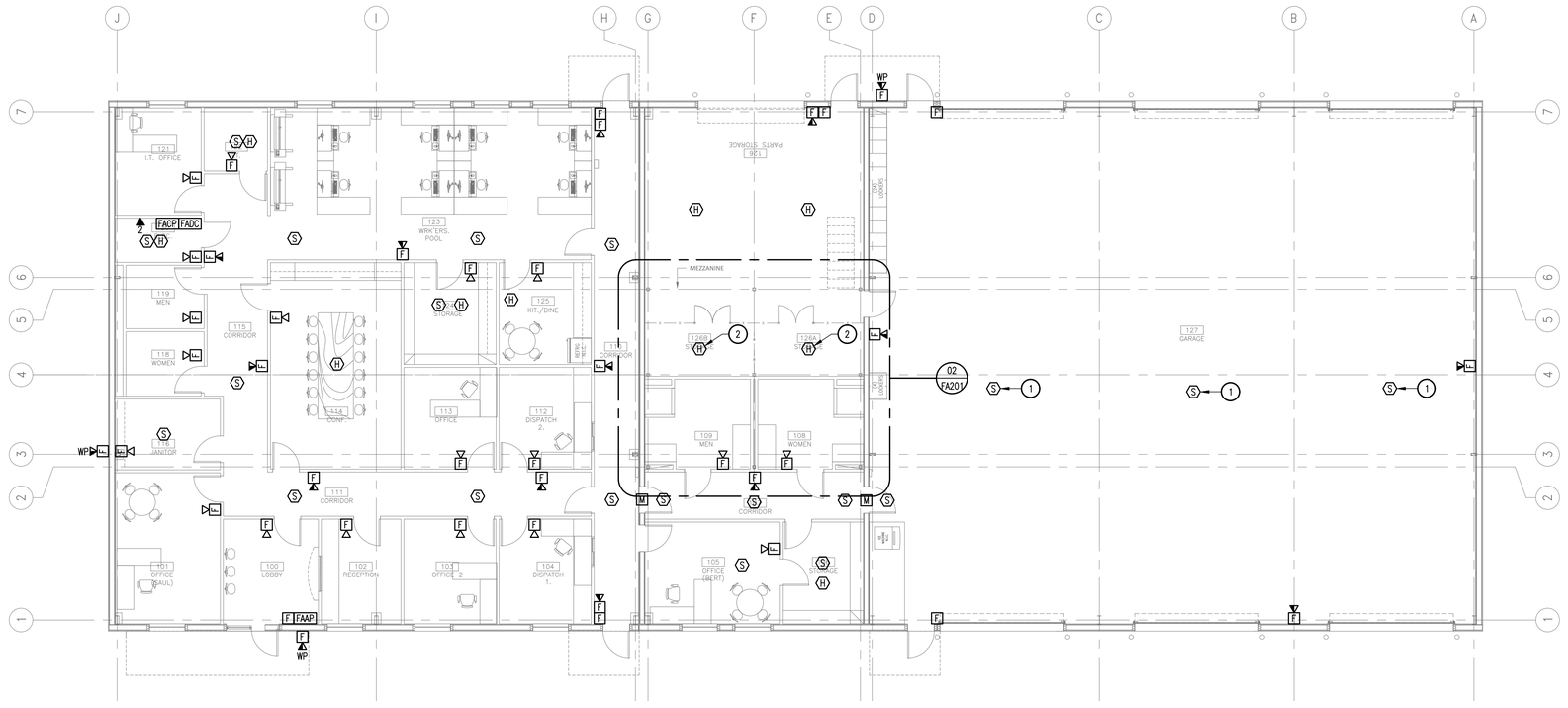
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GENERAL NOTES:

A. REFER TO SHEET FA001 GENERAL NOTES.



02 FIRE ALARM PLAN - MEZZANINE
SCALE: 1/8" = 1'-0"



01 FIRE ALARM PLAN
SCALE: 1/8" = 1'-0"

KEY NOTES:

1. DETECTOR DEVICES SHALL BE 3FT FROM HIGHEST PEAK OF SLOPED CEILING.
2. FURNISH AND INSTALL HEAT DETECTOR DEVICES BELOW MEZZANINE.
3. PROVIDE WITH NEW DUCT SMOKE DETECTORS AT AIR HANDLING UNITS AND TIE IN WITH FIRE ALARM SYSTEMS. COORDINATE WITH HVAC EQUIPMENT AND INSTALLER. IF UNITS ARE PROVIDED WITH FACTORY INSTALLED DUCT SMOKE DETECTORS CONTRACTOR SHALL TIE IN WITH FIRE ALARM SYSTEM.

SUNSET PARK OPERATIONS FACILITY

HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
TBPE FIRM #F-312

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STATE OF TEXAS
GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
11-6-2020

REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER
Bicsi
Jose Delgado
Reg. No. 201201R
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FIRE ALARM PLAN

FA201

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SECURITY LEGEND

SECURITY DEVICES

ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.
SECURITY EQUIPMENT BY OTHERS.

SYMBOL	DESCRIPTION	MNTG. HT. UNO
	JUNCTION BOX FOR IP CAMERA FIXED	–
	JUNCTION BOX FOR IP CAMERA RECESSED CEILING MOUNTED	–
VR	JUNCTION BOX FOR CAMERA VANDAL RESISTANT	–
CR1	JUNCTION BOX FOR PROXIMITY CARD READER INTERIOR. REFER TO ARCHITECTURAL CARD ACCESS ELEVATION DETAILS FOR ACCESS CONTROL COMPONENTS, AND SPECIFICATION SECTIONS UNDER DIVISION 08.	48"AFF
CR2	JUNCTION BOX FOR PROXIMITY CARD READER EXERIOR. REFER TO ARCHITECTURAL CARD ACCESS ELEVATION DETAILS FOR ACCESS CONTROL COMPONENTS, AND SPECIFICATION SECTIONS UNDER DIVISION 08. PROVIDE WITH WEATHER HOOD.	48"AFF
CK	JUNCTION BOX FOR PROXIMITY CARD READER WITH KEYPAD. REFER TO ARCHITECTURAL CARD ACCESS ELEVATION DETAILS FOR ACCESS CONTROL COMPONENTS, AND SPECIFICATION SECTIONS UNDER DIVISION 08.	48"AFF
MD	JUNCTION BOX FOR DUAL TECHNOLOGY MOTION DETECTOR	–
K	JUNCTION BOX FOR SECURITY KEYPAD FOR INTRUSION DETECTION	48"AFF
DC	JUNCTION BOX FOR DOOR CONTACT	–
	JUNCTION BOX FOR SECURITY SIREN	–
G	JUNCTION BOX FOR GLASS BREAK SENSOR	–
P	JUNCTION BOX FOR PANIC BUTTON	–
NVR	JUNCTION BOX FOR NETWORK VIDEO RECORDER – DEVICE WITH MINIMUM OF 90 DAY RECORDING BY OTHERS	–
RXP	JUNCTION BOX FOR PUSH BUTTON TO OPEN/RELEASE ELECTRIC STRIKE AT DOOR.	48"AFF
ICP	JUNCTION BOX FOR INTRUSION DETECTION CONTROL PANEL	–
ACP	JUNCTION BOX FOR ACCESS CONTROL PANEL	–
BMS	JUNCTION BOX FOR BALANCED MAGNETIC SWITCH – DEVICE BY OTHERS	–

SECURITY GENERAL NOTES

A. THE CONTRACTOR SHALL FULLY REVIEW ALL ELECTRICAL POWER PLANS TO IDENTIFY ALL RESPONSIBILITIES AND SCOPE OF WORK.

B. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER SOURCE WIRING IN ACCORDANCE WITH ARCHITECTURAL MILLWORK. ALL INSTALLATIONS SHALL COMPLY WITH ADA REQUIREMENTS.

C. CONTRACTOR SHALL VERIFY ALL REQUIREMENTS BEFORE ANY ROUGH–IN IN ORDER TO COORDINATE MANUFACTURER'S DRAWINGS FOR EQUIPMENT LOCATION AND INSTALLATION ACCESSORIES.

D. COORDINATE RUNS FOR CONDUIT UP IN JOIST AND FOR SUSPENDING REQUIREMENTS IN ACCORDANCE WITH STRUCTURAL PLANS.

E. ALL INTERCOM, DATA, CAMERA, AND TV DEVICES SHALL BE STUBBED UP TO ABOVE ACCESSIBLE CEILING AND TO CABLE TRAY IF PRESENT. THE CONTRACTOR SHALL PROVIDE J–HOOKS AND CONDUITS TO EXTEND CABLING TO WALLS.

F. ALL PENETRATIONS THROUGH FIRE RATED WALLS SHALL HAVE SOUND RETARDING/ABSORBING FIRE STOP MATERIAL.

G. CONDUITS SHALL BE REAMED AND COMPLETED WITH CONNECTORS AND INSULATED BUSHINGS AT BOTH ENDS.

H. BETWEEN ANY TWO PULL POINTS THERE SHALL BE NO CONDUIT WITH GREATER THAN 180 DEGREES OF BENDS OR EQUIVALENT.

I. WHERE CONDUIT LENGTH EXCEEDS 100FT AND/OR TWO 90 DEGREE BENDS OR EQUIVALENT PROVIDE PULL BOXES AS REQUIRED.

J. ALL ZONE CONDUITS (HOME RUN) FOR LOW VOLTAGE COMMUNICATIONS CABLING SHALL BE MARKED AT THEIR TERMINUS WITH A TAG THAT IDENTIFIES "FIRE ALARM, DATA, INTERCOM, ETC" (ROOM NAME AND NUMBER) WHERE THE OTHER END OF THE CONDUIT TERMINATES.

K. ALL CABLES ABOVE CEILING SHALL BE PLENUM RATED.

L. FURNISH AND INSTALL 8'H X 4'W X 3/4"T VERTICALLY HUNG, GRADE AC, PLYWOOD IN COMMUNICATION ROOMS AS INDICATED ON PLANS. PAINT PLYWOOD WITH TWO COATS OF FIRE RETARDANT TO MATCH EXISTING WALL FINISH. COORDINATE WITH ARCHITECT, PRIME CONTRACTOR, AND OWNER FOR INSTALLATION OF BACKBOARD. REFER TO DRAWINGS FOR PROPOSED LOCATION AND DETAILS.

M. THE CONTRACTOR SHALL INCLUDE IN HIS BID TO OWNER MATERIAL AND LABOR REQUIRED TO FURNISH AND INSTALL SMOKE DUCT DETECTORS TO THE AHU'S. FURNISH AND INSTALL TESTING SWITCH. FURNISH LABEL OF AHU SERVED TO EACH TESTING SWITCH.

N. MINIMUM CONDUIT SIZE FOR TWISTED PAIR CABLING (LOW VOLTAGE) SHALL BE NOT SMALLER THAN 1" TRADE SIZE.

O. ABOVE CEILING CABLE SUPPORTING HARDWARE. IN CONJUCTION WITH THE SPECIFIED CABLE TRAY, ACCEPTABLE METHOD INCLUDES BUT IS NOT LIMITED TO J–HOOKS. CABLE SHOULD BE PROPERLY SUPPORTED WITH J–HOOK PATHWAY INSTALLED EVERY 3–5 FT.CABLE CROSS SECTION AREA SHUOLD BE CALCULATED TO A 40% RATIO.

P. CONTRACTOR SHALL PROVIDE EXTERNAL POWER SUPPLY FOR DOOR ASSEMBLY THAT REQUIRES 24VCD TO BE INTEGRATED WITH ACCESS CONTROLLERS.

GENERAL ABBREVIATIONS

ABS	ABOVE BACK SPLASH	CLG	CEILING	GFI	GROUND FAULT INTERRUPTER	NO (N.O.)	NORMALLY OPEN	SW	SWITCH
AFF	ABOVE FINISHED FLOOR	EC	EMPTY CONDUIT	MTD	MOUNT OR MOUNTED	RCPT(S)	RECEPTACLE(S)	UF	UNDERFLOOR
ARS	AREA OF RESCUE SYSTEM	EX	EXISTING	NC (N.C.)	NORMALLY CLOSED	PTZ	PAN–TILT–ZOOM	UG	UNDERGROUND
BFC	BELOW FINISHED CEILING	FSD	FIRE & SMOKE DAMPER	NVR	NETWORK VIDEO RECORDER	SD	SMOKE DAMPER	UNO	UNLESS NOTED OTHERWISE
BOCT	BOTTOM OF CABLE TRAY	G	GROUND (EQUIPMENT)	NIC	NOT IN CONTRACT	SO (S.O.)	SPACE ONLY	WG	WIRE GUARD
C	CONDUIT	GAP	GENERATOR ANNUNCIATOR PANEL	TYP	TYPICAL	SP	SPARE	WP	WEATHERPROOF

NOTES:
1. 48" AFF INDICATES TO TOP OF DEVICE;
   15" AFF INDICATES TO BOTTOM OF DEVICE;
   ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

SECURITY EQUIPMENT BY OTHERS, ROUGH–IN RACEWAY AND J–BOXES BY CONTRACTOR.

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
TBPE FIRM #F-312

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GABRIEL BENAVIDES JR.
119255
LICENSED
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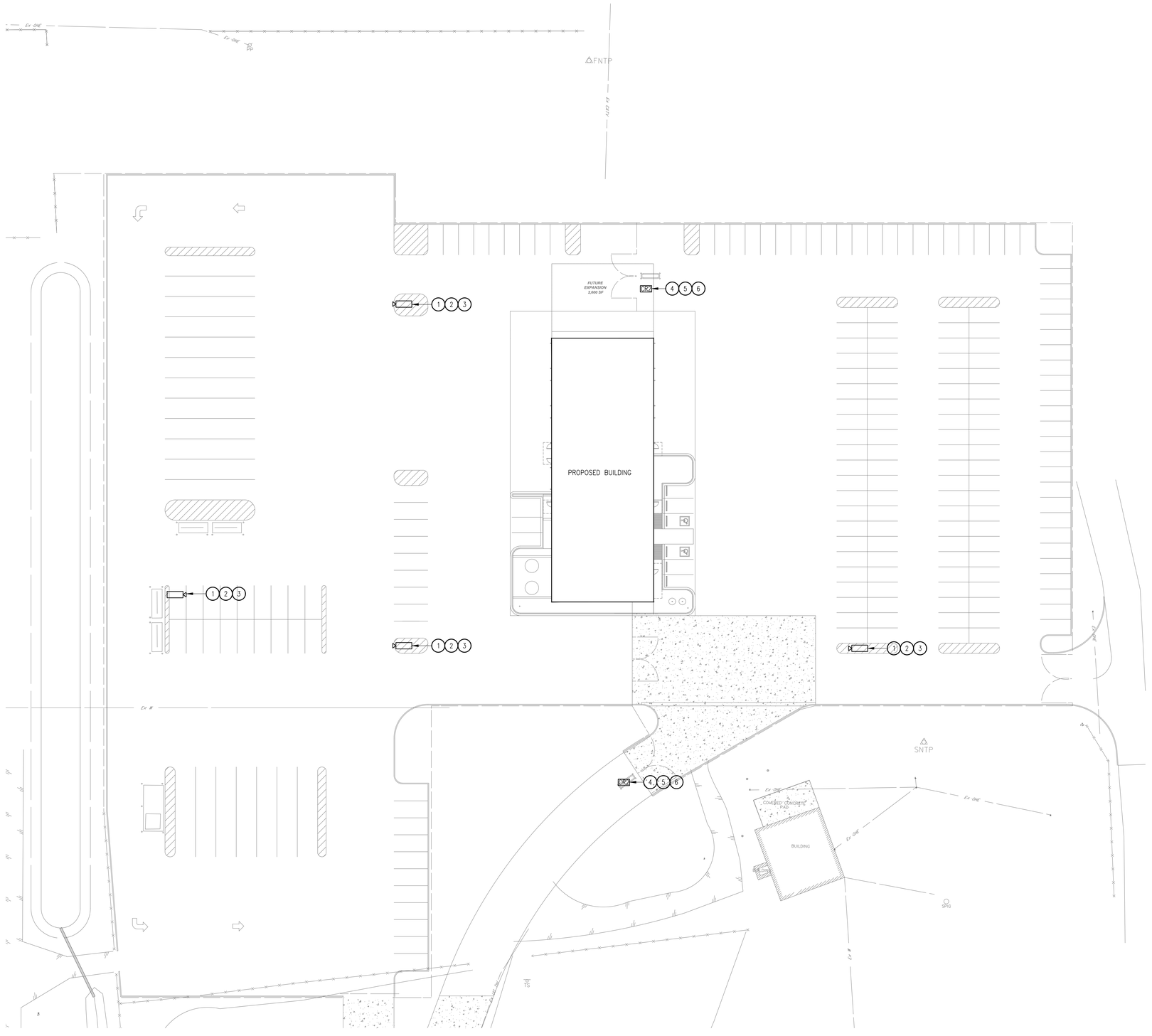
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Bicsi
Jose Delgado
Reg. No. 201201R
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SECURITY SYSTEMS GENERAL LEGEND

TY001
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GENERAL NOTES:

1. REFER TO SHEET TY001 FOR GENERAL NOTES.

KEY NOTES: (#)

1. CONTRACTOR TO COORDINATE WITH OWNER FOR CAMERA HEIGHT AND ORIENTATION.
2. REFER TO ELECTRICAL LIGHTING SITE PLAN FOR PATHWAY ROUTINGS.
3. FURNISH AND INSTALL (1) 1"C FOR CABLE ROUTING. ROUTE FROM IDF-122 INTO EACH POLE.
4. FURNISH AND INSTALL WEATHERPROOF ACCESS CONTROL KEYPAD AT PEDESTAL (IN-BOUND).
5. PROVIDE WITH (1) 3/4" CONDUIT FROM GATE CONTROLLER TO SIREN ACTIVATED GATE SENSOR.
6. CONTRACTOR SHALL COORDINATE WITH ARCHITECT AND FIRE MARSHALL FOR EXACT LOCATION OF KNOX BOX.

01 SECURITY SITE PLAN
SCALE: 1"=30'

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
5000 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
FAX (956) 664-0282
TBPE FIRM #F-312

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GABRIEL BENAVIDES JR.
119255
LICENSED PROFESSIONAL ENGINEER
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Bicsi
Jose Delgado
Reg. No. 201201R
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Sheet Title
SECURITY SITE PLAN

TY101
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GENERAL NOTES:

A. REFER TO SHEET TN001 GENERAL NOTES.

B. ACCESS CONTROL DEVICES AND EQUIPMENT PROVIDED BY OWNER.

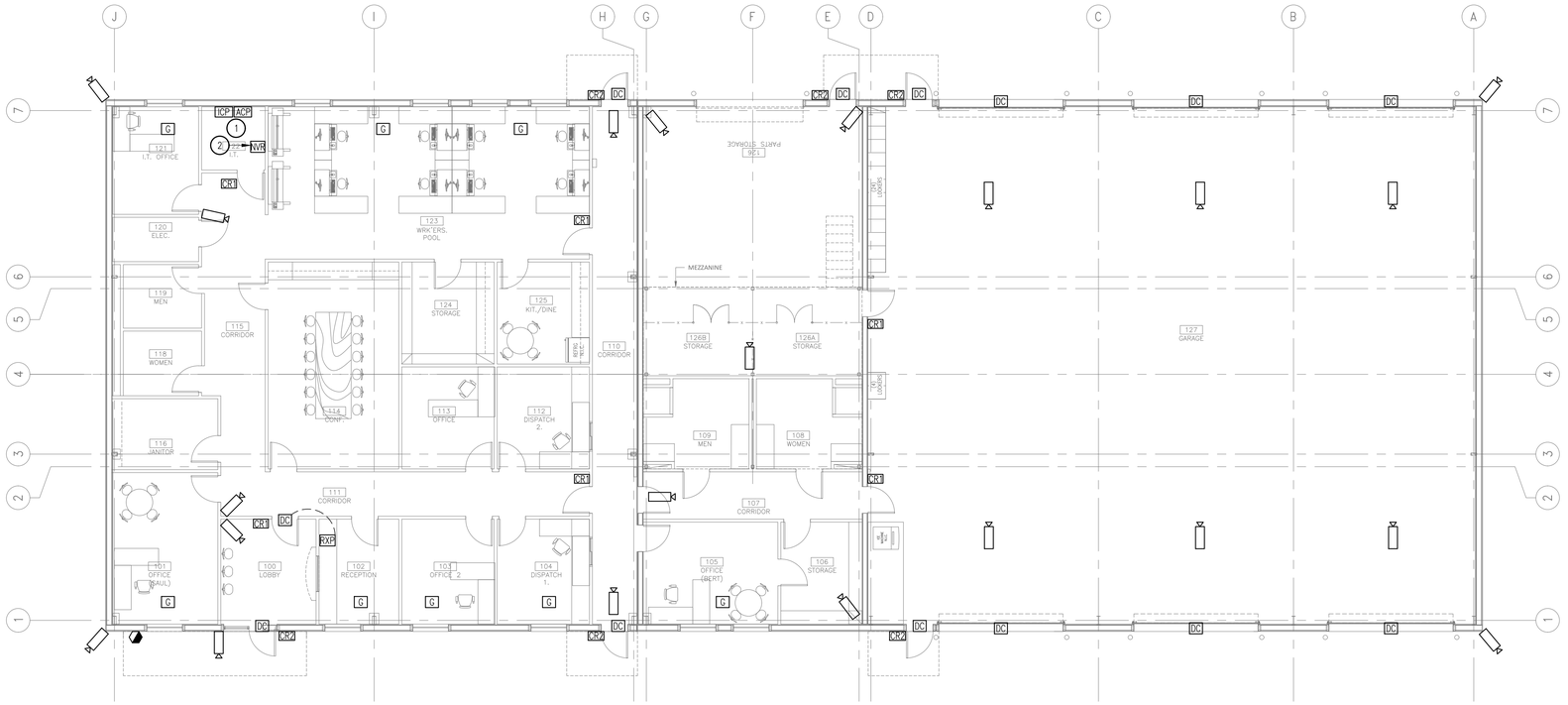
C. SURVEILLANCE SECURITY CAMERAS ARE TO BE FURNISHED AND INSTALLED BY OWNER. EXTERIOR CAMERAS SHALL BE 15FT AFF.

D. PROVIDE WITH 1" CONDUIT TO ROUTE TELECOMMUNICATION AND SECURITY DATA CABLING AT OPEN TO STRUCTURE CEILINGS.

E. CONDUIT RACEWAY TO SECURITY DEVICES IN GARAGE AREAS SHALL BE IN RIGID GALVANIZED CONDUIT.

KEY NOTES: (i)

1. PARKING LOT ACCESS CONTROL PANELS SHALL RESIDE INSIDE IT ROOM.
2. NETWORK VIDEO RECORDER SHALL RESIDE AT NEW NETWORK RACK.



01 SECURITY PLAN
SCALE: 1/8" = 1'-0"

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

HALFF
500 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0050
FAX (956) 664-0282
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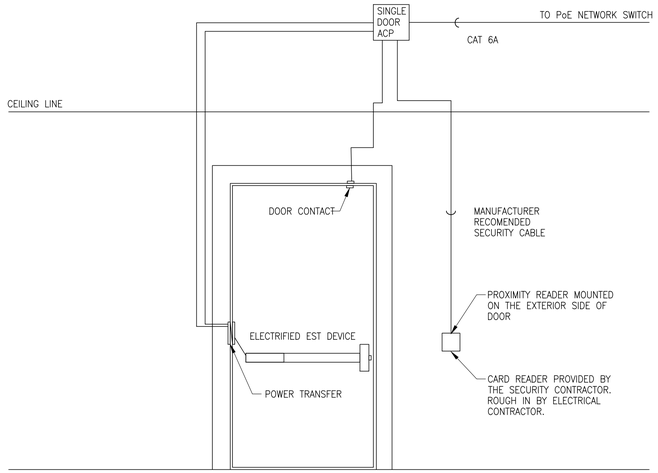
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TY201
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GENERAL NOTES :

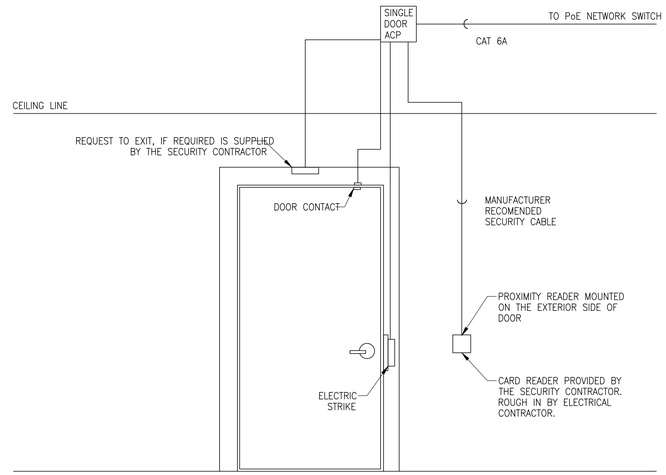
A. ALL CONDUITS SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR.
B. ALL LOW VOLTAGE WIRING SHALL BE PROVIDED BY SECURITY CONTRACTOR.
C. ELECTRICAL AND SECURITY CONTRACTORS SHALL COORDINATE WITH DOOR HARDWARE CONTRACTOR FOR CONDUIT ROUTING AND WIRING OF ACCESS CONTROL SYSTEM.
D. REFER TO ARCHITECHURAL PLANS AND SPECIFICATIONS FOR DOOR HARDWARE.
E. THIS DETAIL IS FOR REFERANCE ONLY.
F. PROVIDE WITH NEMA 1 ENCLOSURE WITH BUSHINGS, MOUNTING PANEL, GROUNDING AND SUPPORTING MEANS.



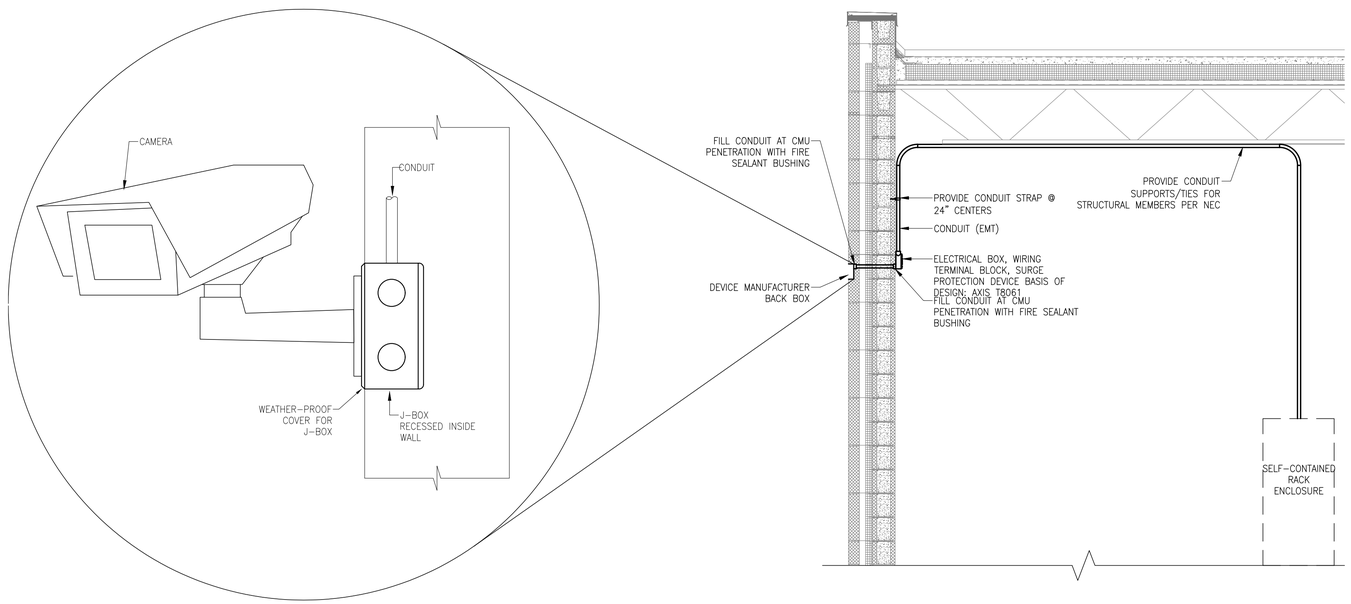
02 TYPICAL OF SINGLE DOOR WITH CARD ACCESS
N.T.S.

GENERAL NOTES:

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E. THIS DETAIL IS FOR REFERANCE ONLY.
F. PROVIDE WITH NEMA 1 ENCLOSURE WITH BUSHINGS, MOUNTING PANEL, GROUNDING AND SUPPORTING MEANS.



03 TYPICAL OF SINGLE OUT & IN DOOR WITH CARD ACCESS
N.T.S.



01 TYPICAL CONDUIT PENETRATION DETAIL
N.T.S.

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HIDALGO COUNTY PRECINCT ONE
SUNSET PARK OFFICE/WAREHOUSE MERCEDES, TX

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500 WEST MILITARY, SUITE 100
MCALLEN, TEXAS 78503
TEL (956) 664-0200
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