Solicitation 1906-328

Server Room at Williamson County Justice Center

Bid Designation: Public

Williamson County, Texas

Bid 1906-328
Server Room at Williamson County Justice Center

Bid Number	1906-328
Bid Title	Server Room at Williamson County Justice Center
Expected Expenditure	**$370,000.00** (This price is expected - not guaranteed)
Bid Start Date	In Held
Bid End Date	Aug 5, 2019 3:30:00 PM CDT
Question & Answer End Date	Jul 26, 2019 3:00:00 PM CDT
Bid Contact	Blake Skiles Senior Purchasing Specialist 512-**943**-1478 blake.skiles@wilco.org
Contract Duration	**270 days**
Contract Renewal	Not Applicable
Prices Good for	**45 days**
Bid Comments	**Williamson County is seeking qualified suppliers to construct a server room at the Williamson County Justice Center located at 405 Martin Luther King St. Georgetown, TX 78626.**

Item Response Form

Item **1906-328-01-01** - Total Proposal Price
Quantity **1 each**
Unit Price
Delivery Location **Williamson County, Texas**
No Location Specified

Qty 1

Description
Total Proposal Price

Item **1906-328-01-02** - Please Attach All Documents To This Line
Quantity **1 each**
Prices are not requested for this item.
Delivery Location **Williamson County, Texas**
No Location Specified

Qty 1

Description
Please Attach All Documents To This Line

Proposal References

List the last three (3) companies or governmental agencies, where the same or similar goods and/or services as contained in this RFP package, were recently provided by Respondent.

Reference 1

Client Name: Location:

Contact Name: Title:

Phone: E-mail

Contract Date To: Contract Date From: Contract Value: $

Scope of Work:

Reference 2

Client Name: Location:

Contact Name: Title:

Phone: E-mail

Contract Date To: Contract Date From: Contract Value: $

Scope of Work:

Reference 3

Client Name:

Location:

Contact Name:

Title:

Phone:

E-mail

Contract Date To:

Contract Date From:

Contract Value: $

Scope of Work:

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

Name of Officer

4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income,other than investment income, from the vendor?

☐ Yes ☐ No

B.Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the directionof the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7 Signature is not required if completing in BIDSYNC electronically;

Signature of vendor doing business with the governmental entity

Date

Form provided by Texas Ethics Commission www.ethics.state.tx.us Revised 11/30/2015

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at http://www.statutes.legis.state.tx.us/ Docs/LG/htm/LG.176.htm. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

(A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or anagency of a federal, state, or local governmental entity;

(B) a transaction conducted at a price and subject to terms available to the public; or

(C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency andthat is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

***

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or afamily member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds $2,500 during the 12-month period preceding the date that the officer becomes aware that

(i) a contract between the local governmental entity and vendor has been executed;or

(ii) the local governmental entity is considering entering into a contract with thevendor;

(B) has given to the local government officer or a family member of the officer one or more giftsthat have an aggregate value of more than $100 in the 12-month period preceding the date the officer becomes aware that:

(i) a contract between the local governmental entity and vendor has been executed;

or (ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that localgovernmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity. (a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(2) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmentalentity; or

(B) submits to the local governmental entity an application, response to a request for proposalsor bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(3) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or(C) of a family relationship with a local government officer.

PUBLIC ANNOUNCEMENT AND GENERAL INFORMATION

WILLIAMSON COUNTY PURCHASING DEPARTMENT
SOLICITATION NUMBER 1906-328
Server Room at Williamson County Justice Center

PROPOSALS MUST BE RECEIVED ON OR BEFORE:
Aug 5, 2019 3:30:00 PM CDT

PROPOSALS WILL BE PUBLICLY OPENED:
Aug 5, 2019 3:30:00 PM CDT

Notice is hereby given that Competitive Sealed Proposals for the above-mentioned construction services will be accepted by the Williamson County Purchasing Department. Williamson County uses BidSync to distribute and receive Proposals. Specifications for this RFCSP may be obtained by registering at www.bidsync.com.

Williamson County prefers and requests electronic submittal of this Proposal.

All electronic proposals must be submitted via: www.bidsync.com

Electronic Proposals are requested, however paper proposals will currently still be received, until further notice and may be mailed or delivered to the address listed below.

Respondents are strongly encouraged to carefully read this entire RFCSP.

All interested Respondents are invited to submit a Proposal in accordance with the Instructions and General Requirements, Proposal Format, Proposal Specifications, and Definitions, Terms and Conditions stated in this RFCSP.

Please note that a complete package must be submitted choosing one of the above two methods. Split packages where a partial submittal is received in paper and a partial submittal is received via BidSync will be considered "unresponsive" and will not be accepted or evaluated.

Williamson County will not accept any Proposals received after the submittal deadline, and shall return such Proposals unopened to the Respondent.

General Information:

- If mailed or delivered in person, Proposal and Proposal addenda are to be delivered in sealed envelope on or before the submittal deadline, as noted in the Public Announcement and General Information listed above for this RFCSP, to:

  Williamson County Purchasing Department
  Attn: **BID NAME AND NUMBER**
  100 Wilco Way
  Suite P101
  Georgetown, TX 78626

  - Respondents should list the Proposal Number, Proposal Name, Name and Address of Respondent, and the Date of the Proposal opening on the outside of the box or envelope and note "Competitive Sealed Proposal Enclosed."
  - Respondent should submit one (1) original.
  - Williamson County will NOT be responsible for unmarked or improperly marked envelopes.
  - Williamson County will not accept any responsibility for Proposals being delivered by third party carriers.
  - Facsimile transmittals will NOT be accepted.

- Proposals will be opened publicly and the names of the offerors and any monetary Proposals made by the offerors, will be read aloud.

- All submitted questions with their answers will be posted and updated on www.bidsync.com.

- It is the Respondent's responsibility to review all documents in BidSync, including any Addenda that may have been added after the document packet was originally released and posted.

  - Any Addenda and/or other information relevant to the RFCSP will be posted on www.bidsync.com.

  - The Williamson County Purchasing Department takes no responsibility to ensure any interested Respondent has obtained any outstanding addenda or additional information.

PROPOSAL AFFIDAVIT

This form must be completed, signed, notarized and returned with Proposal package

The undersigned attests that the company named below, under the provisions of Subtitle F, Title 10, Texas Government Code Chapter 2270:

1. Does not boycott Israel currently; and
2. Will not boycott Israel during the term of the contract.

Pursuant to Section 2270.001, Texas Government Code:

1. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes; and
2. "Company" means a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, or any limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of those entities or business associations that exist to make a profit

The undersigned certifies that the RFSCP and the Respondent's Proposal have been carefully reviewed and are submitted as correct and final. Respondent further certifies and agrees to furnish any and/or all goods and/or services upon which prices are extended at the price Proposal, and upon the conditions contained in the RFSCP.

I hereby certify that the foregoing Proposal has not been prepared in collusion with any other Respondent or other person or persons engaged in the same line of business prior to the official opening of this Proposal. Further, I certify that the Respondent is not now, nor has been for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities Proposal on, or to influence any person or persons to submit a Proposal or not to submit a Proposal thereon."

Name of Respondent:	
Address of Respondent:	
Email:	
Telephone:	
Printed Name of Person Submitting Affidavit:	
Signature of Person Submitting Affidavit:	

Cooperative Purchasing Program

Check one of the following options below. A non-affirmative Proposal will in no way have a negative impact on the County's evaluation of the Proposal.

☐	I will offer the quoted prices to all authorized entities during the term of the County's Contract.
☐	I will not offer the quoted prices to all authorized entities.

***If no box is checked, the Respondent agrees to make best efforts in good faith to offer the quoted prices to all authorized entities. ***

BEFORE ME, the undersigned authority, a Notary Public, personally appeared _____ (*Name of Signer*), who after being by me duly sworn, did depose and say: "I, _____, (*Name of Signer*) am a duly authorized officer of/agent for _____ (*Name of Respondent*) and have been duly authorized to execute the foregoing on behalf of the said _____ (*Name of Respondent*).

SUBSCRIBED AND SWORN to before me by the above-named _____

on this the _____ day of _____, 20_____.

_____

Notary Public in and for

The State of _____

The County of _____

SIGNATURE AND NOTARY NOT REQUIRED IF COMPLETING IN BIDSYNC ELECTRONICALLY.

Williamson County – Request for Competitive Sealed Proposal (RFCSP)

SECTION 1 - DEFINITIONS

Addendum/Addenda – means any written or graphic instruments issued by the County prior to the consideration of Proposals which modify or interpret the Proposal Documents by additions, deletions, clarifications, or corrections.

Agreement/Ensuing Agreement(s) – means the Successful Respondent may be required by the County to sign an additional Agreement containing terms necessary to ensure compliance with the RFCSP and the Respondent's Proposal. Such Ensuing Agreement(s) shall contain the Proposal specifications, terms and conditions that are derived from the RFCSP.

Contract – means this RFCSP and the Proposal of the Successful Respondent shall become a Contract between the Successful Respondent and the County once the Successful Respondent's Proposal is properly accepted by the Williamson County Commissioners Court (sometimes referred to herein as the Commissioner's Court").

Commissioner's Court – means the Williamson County Commissioners Court.

County – means Williamson County, a political subdivision of the State of Texas.

Executive Summary – means the document submitted by Respondent that represents a concise summary of the contents of the Proposal. It does not include any information concerning costs.

Proposal Documents – means the Legal Notice, RFCSP including attachments, and any Addenda issued by the County prior to the consideration of any Proposals.

Proposal – means the complete, properly signed document, and ALL required forms and documentation listed in the proposal package which have been submitted in accordance with this RFCSP package. A Proposal submitted in accordance with this RFCSP is irrevocable during the specified time period for evaluation and acceptance of Proposals, unless a waiver is obtained from the Williamson County Purchasing Agent.

Respondent – means a person or entity who submits a Proposal in response to this RFCSP.

Request for Competitive Sealed Proposals (RFCSP) – means this document, together with the attachments thereto and any future Addenda issued by the County.

Successful Respondent– means the responsible Respondent who, in the County's sole opinion, submits the Proposal which is in the best interest of the County, taking into account factors identified

herein, and to whom the County intends to award the Contract.

SECTION 2 - RESPONSE FORMAT AND SUBMISSION

2.1 INTRODUCTION

Each Proposal submitted in response to this RFCSP should clearly reference the numbered sections of this RFCSP that require a response. Failure to arrange the Proposal as requested may result in the disqualification of the Proposal.

Though there is not a page limit for Proposals, to save natural resources including paper, and to allow the County staff to efficiently evaluate all submitted Proposals, the County requests that Proposals be orderly, concise, but comprehensive in providing the requested information. Conciseness and clarity of content are emphasized and encouraged. If mailed or delivered in person, please limit additional, non-requested information.

Please provide your Proposal response using:

A. 8 ½" x 11" pages, inclusive of any cover letter or supporting materials.

B. The least amount of plastic/laminate or other non-recyclable binding materials.

C. Single-sided printing.

Vague and general Proposals will be considered non-responsive, and may, at the County's sole discretion, result in disqualification. Proposals must be legible and complete. Failure to provide the required information may result in the disqualification of the Proposal. All pages of the Proposal should be numbered and the Proposal should contain an organized, paginated table of contents corresponding to the sections and pages of the Proposal.

2.2 ORGANIZATION OF PROPOSAL CONTENTS AND TABLE OF CONTENTS

Each Proposal should be submitted with a table of contents that clearly identifies and denotes the location of all enclosures of the Proposal. The table of contents should follow the RFCSP's structure as much as is practical.

Each Proposal should be organized in the manner described below:

A. Transmittal Letter. Please see Section 2.3, Transmittal Letter, for more information.

B. Table of Contents.

C. Executive Summary. Please see Section 2.4, Executive Summary.

D. Proposal Response to Criteria. (Please see the sections in this RFCSP package that list the Specifications & Cost Proposal, Experience and Qualifications, References, and Implementation Strategy to respond to our criteria in a clear and concise manner)

E. Price Sheet.

F. References: Identification of three (3) references within the last four (4) years, for which the Respondent is providing, or has provided, the goods and/or services (public sector) of the type requested in this RFCSP. Include the name, position/title, and telephone number of a contact person at each entity.

G. Conflict of Interest Questionnaire.

H. Proposal Affidavit (Signature Page).

I. Attach your entities sample Contract, if applicable, for the County's review and consideration. This should include any additional terms or conditions. The County is not required to use the sample Contract submitted.

2.3 TRANSMITTAL LETTER

The Respondent should submit a Transmittal Letter that provides the following information:

A. Name and address of individual or business entity submitting the Proposal.

B. Respondent's type of business entity (i.e., Corporation, General Partnership, Limited Partnership, LLC, etc.). See Section 3.5, Signature of Respondent, for more information.

C. Place of incorporation or organization, if applicable.

D. Name and location of major offices and other facilities that relate to the Respondent's performance under the terms of this RFCSP.

E. Name, physical address, email address, business and fax number of the Respondent's principal contact person regarding all contractual matters relating to this RFCSP.

F. The Respondent's Federal Employer Identification Number.

G. A commitment by the Respondent to provide the services required by the County;

H. A statement that the Proposal is valid for the time specified on page three (3), under the section named *Prices Good for*, of this Proposal packet. Any Proposal containing a term of less than the required amount, may at the County's sole discretion, be rejected as non-responsive.

I. If the Proposal being submitted will have an effect on air quality for the County (as it relates to any state, federal, or voluntary air quality standard), then the Respondent is encouraged to provide information in narrative indicating the anticipated air quality impact. See Section 4.40, Air Quality for more information.

The Transmittal Letter should be signed by a person legally authorized to bind the Respondent to the representations in the Transmittal Letter and the Proposal. In the case of a joint Proposal, each party must sign the Transmittal Letter.

2.4 EXECUTIVE SUMMARY

The Respondent should provide an Executive Summary of its Proposal that asserts that the Respondent is providing in its response all of the requirements of this RFCSP. The Executive Summary should not include any information concerning the cost of the Proposal, but instead must represent a full and concise summary of the contents of the Proposal. It is recommended the Executive Summary include the following information:

A. Identify any goods and/or services that are provided beyond those specifically requested. If the Respondent is providing services and/or goods that do not meet the specific requirements of this RFCSP, but in the opinion of the Respondent are equivalent or superior to those specifically requested, any such differences should be noted in the Executive Summary. However, the Respondent must realize that failure to provide the goods and/or services specifically required, at the County's sole discretion, may result in disqualification of

the Proposal.

B. Indicate why the Respondent believes that it is the most qualified Respondent to provide the services described in this RFCSP. The Successful Respondent must demonstrate extensive experience and understanding of the intent of this project. The Respondent should describe in detail the current and historical experience the Respondent and its subcontractors have that would be relevant to completing the project. References must contain the name of key personnel and telephone numbers for each contact, as described in Section 3.14, References.

C. Briefly state why the Respondent believes its proposed goods and/or services best meet the County's needs and RFCSP requirements, and the Respondent also should concisely describe any additional features, aspects, or advantages of its goods and/or services in any relevant area not covered elsewhere in its Proposal.

2.5 CONFLICT OF INTEREST

No public official shall have interest in a contract, in accordance with Vernon's Texas Codes Annotated, Local Government Code, Title 5, Subtitle C, Chapter 171, as amended.

As of January 1, 2006, all Respondents are responsible for complying with Local Government Code, Title 5, Subtitle C, Chapter 176. Additional information may be obtained from the County's website at the following link:

http://www.wilco.org/Departments/Purchasing/Conflict-of-Interest

Each Respondent must disclose any existing or potential conflict of interest relative to the performance of the requirements of this RFCSP. **Examples of potential conflicts of interest may include an existing business or personal relationship between the Respondent, its principal, or any affiliate or subcontractor with the County or any other entity or person involved in any way with the project that is subject to this RFCSP**. Similarly, any personal or business relationship between the Respondent, the principals, or any affiliate or subcontractor with any employee, or official of the County or its suppliers must be disclosed. Any such relationship that might be perceived or represented as a conflict must be disclosed. Failure to disclose any such relationship or reveal personal relationships with the County employees or officials may be cause for termination.

The County will decide if an actual or perceived conflict should result in Proposal disqualification.

By submitting a Proposal in response to this RFCSP, all Respondents affirm they have not given, nor intend to give, at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a County public servant or any employee, official or representative of same, in connection with this procurement.

Each Respondent must provide a Conflict of Interest Statement.

2.6 CERTIFICATE OF INTERESTED PARTIES – FORM 1295

As of January 1, 2016, all Respondents are responsible for complying with the Texas Government Code, Section 2252.908. The law states that the County may not enter into certain contracts with a Respondent unless the Respondent submits a disclosure of interested parties to the County at the time the Respondent submits the signed contract. The law applies only to a contract of the County on or after January 1, 2016 that either:

A. Requires an action or vote by the Commissioners Court before the contract may be signed (all contracts that fall under the jurisdiction of the Commissioners Court approval, such as

contracts resulting from an Initiation for Bid (IFB), RFP, RFCSP, Request for Qualifications (RFQ), etc., excluding, but not limited to, certain Juvenile Service contracts, contracts funded with Sheriff's seized fun monies, etc.); or

B. Has a value of at least $1,000,000.

By January 1, 2016, the Texas Ethics Commission will make available on its website, a new filing application that must be used to file Form 1295. Information regarding how to use the filing application is available on the Texas Ethics Commission website at the following link:

https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

A Respondent must:

A. Use the online application to process the required information on Form 1295.

B. Print a copy of the form which will contain a unique certification number.

C. An authorized agent of the Respondent must sign the printed copy of the form.

D. Have the form notarized.

E. File the completed Form 1295 and certification of filing (scanning and emailing form is sufficient) with Williamson County Purchasing Agent at the time the signed Contract is submitted for approval.

After the Commissioners Court award of the contract, the County shall notify the Texas Ethics Commission, using the Texas Ethics Commission's filing application, of the receipt of the filed Form 1295 and certification of filing not later than the 30th day after the date the contract binds all parties to the contract. The Texas Ethics Commission will post the completed Form 1295 to its website within seven business days after receiving notice from the County.

2.7 PROPOSAL AFFIDAVIT

The Respondent attests to abiding by Texas Government Code Chapter 2270, Subtitle F, Title 10 stating that they neither currently boycott Israel, nor will the boycott Israel during the term of the contract. Furthermore, the Respondent certifies and agrees to furnish any and/or all goods and/or services upon which prices are extended at the price Proposal, and upon the conditions contained in the RFCSP. Additionally, the Respondent certifies that the Proposal has not been prepared in collusion with any other Proposer or other person or persons engaged in the same line of business prior to the official opening of this Proposal. Further, Proposer certifies that the he or she is not now, nor has been for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities Proposal on, or to influence any person or persons to submit a Proposal or not to submit a Proposal thereon. **Each Respondent must provide a Proposal Affidavit with their Proposal Package. Package may be deemed incomplete without this form.**

2.8 PROPOSAL SUBMITTAL DEADLINE

The Proposal is due no later than the submittal date and time set forth in the Public Announcement and General Information listed in this RFCSP package. Contents of each Proposal shall be submitted in accordance with this RFCSP.

2.9 ETHICS

The Respondent shall not accept or offer gifts or anything of value, nor enter into any business arrangement with any employee, official or agent of the County.

2.10 DELIVERY OF PROPOSALS

The County uses BidSync to distribute and receive bids and Proposals. It is preferred that Proposals be submitted electronically through BidSync; however, Respondents can submit a hard copy. Please be aware that submitting proposals electronically is a convenience to the respondent. **Williamson County takes no responsibility for any third-party system interruption potentially causing late delivery of respondent's submittal.**

Refer to www.bidsync.com for further information on how to submit electronically.

If mailed or delivered in person, Proposal and Proposal Addenda are to be delivered in sealed envelope on or before the submittal deadline, as noted in the Public Announcement and General Information listed in this RFCSP package, to:

Williamson County Purchasing Department
Attn: **Proposal Name and Number**
100 Wilco Way, Suite P101
Georgetown, Texas 78626

Also, all Respondents should list their Name and Address, and the Date of the Proposal opening on the outside of the box or envelope and note "Competitive Sealed Proposal Enclosed." Williamson County will not accept any Proposals after the submittal deadline, and shall return such Proposals unopened to the Respondent. The County will not accept any responsibility for Proposals being delivered by third party carriers.

Proposals will be opened publicly and the names of the offerors and any monetary proposals made by the offerors, will be read aloud.

SECTION 3 - INSTRUCTIONS AND GENERAL REQUIREMENTS

3.1 INSTRUCTIONS

Read this document carefully, and follow all instructions and requirements. All Respondents are responsible for fulfilling all requirements and specifications. Be sure to have a clear understanding of this RFCSP.

General requirements apply to all advertised RFCSPs; however, these may be superseded, in whole or in part, by the proposal specifications, Addenda and modifications issued as a part of this RFCSP. Be sure your Proposal package is complete.

3.2 AMBIGUITY, CONFLICT, OR OTHER ERRORS IN THIS RFCSP

If a Respondent discovers any ambiguity, conflict, discrepancy, omission or other error in this RFCSP, the Respondent shall immediately notify the County Purchasing Department of such error in writing and request modification or clarification of the document.

Modifications will be made by issuing Addenda. If the Respondent fails to notify the County prior to the date and time fixed for submission of Proposals of an error or ambiguity in the RFCSP known to the Respondent, or an error or ambiguity that reasonably should have been known to the Respondent, then the Respondent shall be deemed to have waived the error or ambiguity or its later resolution.

The County may also modify the RFCSP, no later than forty-eight (48) hours prior to the date and time fixed for submission of Proposals, by issuance of an Addendum. All Addenda will be numbered consecutively, beginning with one (1).

3.3 NOTIFICATION OF MOST CURRENT ADDRESS

All Respondents in receipt of this RFCSP shall notify the Williamson County Purchasing Department of any address changes, contact person changes, and/or telephone number changes no later than forty-eight (48) hours prior to the date and time fixed for submission of Proposals.

3.4 SIGNATURE OF RESPONDENT

A Transmittal Letter, which shall be considered an integral part of the Proposal as stated in Section 2.3, Transmittal Letter, shall be signed by an individual who is authorized to bind the Respondent contractually.

A. If the Respondent is a Corporation or Limited Liability Company, the legal name of the Corporation or Limited Liability Company shall be provided together with the signature of the officer or officers authorized to sign on behalf of such entity.

B. If the Respondent is a General Partnership, the true name of the firm shall be provided with the signature of each partner authorized to sign.

C. If the Respondent is a Limited Partnership, the name of the Limited Partner's General Partner shall be provided with the signature of the officer authorized to sign on behalf of the General Partner.

D. If the Respondent is a Sole Proprietor(s) (individual), each Sole Proprietor(s) shall sign.

E. If signature is by an agent, other than the Sole Proprietor(s) or an officer of a Corporation, Limited Liability Company, General Partner or a member of a General Partnership, a power of attorney or equivalent document must be submitted to the Williamson County Purchasing Department.

3.5 ASSUMED BUSINESS NAME

If the Respondent operates business under an Assumed Business Name, the Respondent must have on file with the Williamson County Clerk a current Assumed Name Certificate and provide a file marked copy of same prior to contract award.

3.6 ECONOMY OF PRESENTATION

Proposals should not contain promotional or display materials, except as they may directly answer in whole or in part questions contained in the RFCSP. Such exhibits shall be clearly marked with the applicable reference number of the question in the RFCSP. Proposals must address the technical requirements as specified in the RFCSP. All questions posed by the RFCSP must be answered concisely and clearly. Proposals that do not address each criterion may be, at the sole discretion of the County, rejected and not considered.

3.7. REJECTION OR ACCEPTANCE

It is understood that the Commissioners Court of Williamson county, Texas, reserves the right to accept or reject any and/or all proposals for any or all materials and/or services covered in the RFP, and to waive informalities or defects in the proposal or to accept such proposal it shall deem to be in the best interest of Williamson County.

3.8 PROPOSAL OBLIGATION

The contents of the RFCSP, Proposal, and any clarification thereof submitted by the Successful Respondent shall become part of the contractual obligation and incorporated by reference into the Contract and any Ensuing Agreement(s).

3.9 COMPLIANCE WITH RFCSP SPECIFICATIONS

It is intended that this RFCSP describe the requirements and the Proposal format in sufficient detail to secure comparable Proposal. Failure to comply with all provisions of the RFCSP may, at the sole discretion of the County, result in disqualification.

3.10 EVALUATION

The County reserves the right to use all pertinent information (also learned from sources other than disclosed in the RFCSP process) that might affect the County's judgment as to the appropriateness of an award to the best evaluated Respondent. This information may be appended to the Proposal evaluation process results. Information on a Respondent from reliable sources, and not within the Respondent's Proposal, may also be noted and made part of the evaluation file. The County shall have sole discretion for determining the reliability of the source. The County reserves the right to conduct written and/or oral discussions/interviews after the Proposal opening. The purpose of such discussions/interviews is to provide clarification and/or additional information to make an award that is in the best interest of the County.

3.11 WITHDRAWAL OF PROPOSAL

The Respondent may withdraw its Proposal by submitting a written request with the company letterhead and the signature of an authorized individual, as described in Section 3.4, Signature of Respondent, to the Williamson County Purchasing Department any time prior to the submission

deadline.

The Respondent may submit a new Proposal prior to the deadline. Alterations of the Proposal in any manner will not be considered if submitted after the deadline. Withdrawal of a Proposal after the deadline will be subject to written approval of the Williamson County Purchasing Agent.

3.12 RESPONSIBILITY

It is expected that a Respondent will be able to affirmatively demonstrate responsibility. A prospective Respondent should be able to meet the following requirements:

A. Have adequate financial resources, or the ability to obtain such resources as required;
B. Be able to comply with the required or proposed delivery schedule;
C. Have a satisfactory record of performance that can be determined thru references provided; and
D. Be otherwise qualified and eligible to receive an award.

The County may request representation and other information sufficient to determine the Respondent's ability to meet these minimum standards listed above.

3.13 PURCHASE ORDERS

If required by the Williamson County Purchasing Department, a purchase order(s) may be generated to the Successful Respondent for goods and/or services. If a purchase order is issued, the purchase order number must appear on all itemized invoices and/or requests for payment.

3.14 SILENCE OF SPECIFICATIONS

The apparent silence of any RFCSP specifications as to any detail or to the apparent omission from it of a detailed description concerning any point, shall be regarded as meaning that only the best practices are to prevail. All interpretations of these specifications shall be made on the basis of this statement.

3.15 REFERENCES

Respondents shall furnish a list of contracts where similar responsibilities and goods and/or services have been required and/or performed for the past five (5) years, to include names, titles, phone numbers and email addresses of reference contacts, contract numbers and dates of performance.

Also, Respondents shall include a list of any contracts that have been cancelled or terminated within the last five (5) years, along with an explanation of the cancellation and the names, email address and phone number of a reference person with that institution.

The County may contact some or all of the references in order to determine the Respondent's performance record on work similar to that described in this RFCSP. The County reserves the right to contact references other than those provided in the response and to use the information gained from them in the evaluation process.

References should be provided in accordance with this RFCSP. Proposal may not be deemed complete without the inclusion of requested references.

SECTION 4 - TERMS AND CONDITIONS

4.1 VENUE AND GOVERNING LAW

The Respondent hereby agrees and acknowledges that venue and jurisdiction of any suit, right, or cause of action arising out of or in connection with this RFCSP, the Contract and any Ensuing Agreement(s), shall lie exclusively in either Williamson County, Texas or in the Austin Division of the Western Federal District of Texas, and the parties hereto expressly consent and submit to such jurisdiction. Furthermore, except to the extent that this RFCSP, the Contract and any Ensuing Agreement(s) is governed by the laws of the United States, this RFCSP, the Contract and any Ensuing Agreement(s) shall be governed by and construed in accordance with the laws of the State of Texas, excluding, however, its choice of law rules.

4.2 INCORPORATION BY REFERENCE AND PRECEDENCE

A. The Contract shall be derived from the RFCSP and its Addenda (if applicable), and the Respondent's Proposal. In the event of a dispute under the Contract, applicable documents will be referred to for the purpose of clarification or for additional detail in the following order of precedence:

   1. The RFCSP and its Addenda (if applicable); and

   2. The Respondent's Proposal.

B. In the event the County requires that an Ensuing Agreement be executed following award and a dispute arises between the terms and conditions of the Ensuing Agreement, the RFCSP and its Addenda (if applicable), and the Respondent's Proposal, applicable documents will be referred to for the purpose of clarification or for additional detail in the following order of precedence:

   1. The terms and conditions of the Ensuing Agreement;

   2. The RFCSP and its Addenda; and

   3. The Respondent's Proposal.

4.3 OWNERSHIP OF PROPOSAL

Each Proposal shall become the property of the County upon submittal and will not be returned to Respondents unless received after the submittal deadline.

4.4 DISQUALIFICATION OF RESPONDENT

Upon signing and submittal of the Proposal, a Respondent offering to sell supplies, materials, services, or equipment to the County, certifies that the Respondent has not violated the antitrust laws of the State of Texas codified in Business & Commerce Code, Section 15.01, or the Federal Antitrust Laws, and has not communicated directly or indirectly the offer made to any competitor or any other person engaged in such line of business. Any or all Proposals may be rejected if the County believes that collusion exists among the Respondents.

4.5 FUNDING

The County intends to budget and make sufficient funds available and authorize funds for expenditure to finance the costs of the Contract. All Respondents understand and agree that the County's payment of amounts under the Contract shall be contingent on the County receiving appropriations or other expenditure authority sufficient to allow the County, in the exercise of reasonable administrative discretion, to make payments under this Contract.

A. ASSIGNMENT, SUCCESSORS AND ASSIGNS

The Successful Respondent may not assign, sell, or otherwise transfer the Contract or any other rights or interests obtained under the Contract without written permission of the Williamson County the Commissioners Court. The Contract and any Ensuing Agreement(s) shall be binding upon and inure to the benefit of the contracting parties hereto and their respective successors and permitted assigns.

4.6 IMPLIED REQUIREMENTS

Products or services not specifically described or required in the RFCSP, but are necessary to provide the functional capabilities described by the Respondent, shall be implied and deemed to be included in the Proposal.

4.7 TERMINATION

A. Termination for Cause: The County reserves the right to terminate the Contract and/or any Ensuing Agreement(s) for default if the Successful Respondent breaches any of the Proposal specifications, terms and conditions, including warranties of the Respondent, if any, or if the Successful Respondent becomes insolvent or commits acts of bankruptcy. Such right of termination is in addition to and not in lieu of any other remedies the County may have at law or in equity or as may otherwise be provided hereunder. Default may be construed as, but not limited to, failure to deliver the proper goods and/or services within the proper amount of time, and/or to properly perform any and all other requirements to the County's satisfaction, and/or to meet all other obligations and requirements.

B. Termination for Convenience: The County may terminate the Contract and/or any Ensuing Agreement(s) for convenience and without cause or further liability, upon no less than thirty (30) calendar days written notice to the Successful Respondent. The County reserves the right to extend this period if it is in the best interest of the County. In the event the County exercises its right to terminate without cause, it is understood and agreed that only the amounts due to the Successful Respondent for goods, commodities and/or services provided and expenses incurred to and including the date of termination, will be due and payable. No penalty will be assessed for the County's termination for convenience.

4.8 NON-PERFORMANCE

It is the objective of the County to obtain complete and satisfactory performance of the requirements set forth herein. In addition to any other remedies available at law, in equity or that may be set out herein, failure to perform may result in a deduction of payment equal to the amount of the goods and/or services that were not provided and/or performed to the County's satisfaction.

In the event of such non-performance, the County shall have the right, but shall not be obligated, to complete the services itself or by others and/or purchase the goods from other sources. If the County elects to acquire the goods or perform the services itself or by others, pursuant to the foregoing, the Successful Respondent shall reimburse the County, within ten (10) calendar days of demand, for all costs incurred by the County (including, without limitation, applicable, general, and administrative expenses, and field overhead, and the cost of necessary equipment, materials, and field labor) in correcting the nonperformance which the Successful Respondent fails to meet

pursuant to the requirements set out herein. In the event the Successful Respondent refuses to reimburse the County as set out in this provision, the County shall have the right to deduct such reimbursement amounts from any amounts that may be then owing or that may become owing in the future to the Successful Respondent.

4.9 PROPRIETARY INFORMATION AND THE TEXAS PUBLIC INFORMATION ACT

All material submitted to the County shall become public property and subject to the Texas Public Information Act upon receipt. If a Respondent does not desire proprietary information in the Proposal to be disclosed, each page must be clearly identified and marked proprietary at time of submittal or, more preferably, all proprietary information may be placed in a folder or appendix and be clearly identified and marked as being proprietary. Failure to clearly identify and mark information as being proprietary as set forth under this provision will result in all unmarked information being deemed non-proprietary and available to the public. For all information that has not been clearly identified and marked as proprietary by the Respondent, the County may choose to place such information on the County's website and/or a similar public database without obtaining any type of prior consent from the Respondent.

The County will, to the extent allowed by law, endeavor to protect from public disclosure the information that has been identified and marked as proprietary. The final decision as to what information must be disclosed, however, lies with the Texas Attorney General.

To the extent, if any, that any provision in this RFCSP or in the Respondent's Proposal is in conflict with Texas Government Code, Chapter 552, as amended (the "Public Information Act"), the same shall be of no force or effect. Furthermore, it is expressly understood, and agreed, that the County, and its officers and employees, may request advice, decisions and opinions of the Attorney General of the State of Texas in regard to the application of the Public Information Act to any items or data furnished to the County as to whether or not the same are available to the public. It is further understood that that the County, and its officers and employees, shall have the right to rely on the advice, decisions and opinions of the Attorney General, and that the County, its officers and employees shall have no liability or obligation to any party hereto for the disclosure to the public, or to any person or persons, of any items or data furnished to the County by a party hereto, in reliance of any advice, decision or opinion of the Attorney General of the State of Texas.

4.10 RIGHT TO AUDIT

The Successful Respondent agrees that the County or its duly authorized representatives shall, until the expiration of three (3) years after termination or expiration of the services to be performed, have access to and the right to examine and photocopy any and all books, documents, papers and records of the Successful Respondent, which are directly pertinent to the services to be performed or goods to be delivered for the purposes of making audits, examinations, excerpts and transcriptions. The Successful Respondent agrees that the County shall have access during normal working hours to all necessary facilities and shall be provided adequate and appropriate work space in order to conduct audits in compliance with the provisions of this section. The County shall give the Successful Respondent reasonable advance notice of intended audits.

4.11 TESTING AND INSPECTIONS

The County reserves the right to inspect and test equipment, supplies, materials and goods for quality and compliance with this RFCSP, and ability to meet the needs of the user. Demonstration units must be available for review. Should the goods or services fail to meet requirements and/or be unavailable for evaluation, the County can deem the Respondent to be in breach and terminate the Contract and/or any Ensuing Agreement(s).

4.12 PROPOSAL PREPARATION COSTS

The cost of developing Proposals is the sole responsibility of the Respondents and shall not be charged to the County. There is no expressed or implied obligation for the County to reimburse the Respondents for any expense incurred in preparing a Proposal in response to this RFCSP and the County will not reimburse the Respondents for such expenses.

4.13 INDEMNIFICATION

The Successful Respondent shall indemnify, defend and save harmless, the County, its officials, employees, agents and agent's employees from, and against, all claims, liability, and expenses including reasonable attorneys' fees, arising from activities of the Respondent, its agents, servants or employees, performed hereunder that result from the negligent act, error, or omission of the Respondent or any of the Respondent's agents, servants or employees, as well as all claims of loss or damage to the Respondent's and the County's property, equipment, and/or supplies.

Furthermore, the County, its officials, employees, agents and agents' employees shall not be liable for damages to the Successful Respondent arising from any act of any third party, including, but not limited to, theft. The Successful Respondent further agrees to indemnify, defend and save harmless, the County from its officials, employee, agents and agents' employees against all claims of whatever nature arising from any accident, injury, or damage whatsoever, caused to any person, or the property of any person, occurring in relation to the Successful Respondent's performance of any services requested hereunder during the term of the Contract and/or any Ensuing Agreement (s).

The Successful Respondent shall timely report all claims, demands, suits, actions, proceedings, liens or judgements to the County and shall, upon the receipt of any claim, demand, suit, action, proceeding, lien or judgement, not later than the fifteenth (15^{th}) day of each month; provide the County with a written report on each such matter, setting forth the status of each matter, the schedule or planned proceedings with respect to each matter and the cooperation or assistance, if any, of the County required by the Successful Respondent in the defense of each matter. The Successful Respondent's duty to defend, indemnify and hold the County harmless shall be absolute. It shall not abate or end by reason of the expiration or termination of the Contract and/or any Ensuing Agreement(s), unless otherwise agreed by the County in writing. The provisions of this section shall survive the termination of the Contract and shall remain in full force and effect with respect to all such matters no matter when they arise.

In the event of any dispute between the parties, as to whether a claim, demand, suit, action, proceeding, lien or judgement, that appears to have been caused by or appears to have arisen out of or in connection with acts or omissions of the County, the Respondent shall nevertheless fully defend such claim, demand, suit or action, proceeding, lien or judgement, until and unless there is a determination by a court of competent jurisdiction that the acts and omissions of the Respondent are not an issue in the matter.

The Successful Respondent's indemnification shall cover, and the Successful Respondent agrees to, indemnify the County, in the event the County is found to have been negligent for having selected the Successful Respondent to perform the work described in this request. The provision by the Successful Respondent of insurance shall not limit the liability of the Successful Respondent under the Contract and/or any Ensuing Agreement(s).

4.14 WAIVER OF SUBROGATION

The Successful Respondent and the Successful Respondent's insurance carrier waive any and all rights whatsoever with regard to subrogation against the County as an indirect party to any suit arising out of personal or property damages resulting from the Respondent's performance under this Contract and any Ensuing Agreement(s).

4.15 RELATIONSHIP OF THE PARTIES

The Successful Respondent shall be an independent contractor and shall assume all of the rights, obligations, liabilities, applicable to it as such independent contractor hereunder and any provisions herein which may appear to give the County the right to direct the Successful Respondent as to details of doing work herein covered, or to exercise a measure of control over the work, shall be deemed to mean that the Successful Respondent shall follow the desires of the County in the results of the work only. The County shall not retain or have the right to control the Successful Respondent's means, methods or details pertaining to the Successful Respondent's performance of the work. The County and the Successful Respondent hereby agree and declare that the Successful Respondent is an independent contractor and as such meets the qualifications of an "Independent Contractor" under Texas Workers Compensation Act, Texas Labor Code, Section 406.141, that the Successful Respondent is not an employee of the County, and that the Successful Respondent and its employees, agents and subcontractors shall not be entitled to workers compensation coverage or any other type of insurance coverage held by the County.

4.16 SOLE PROVIDER

The Successful Respondent agrees and acknowledges that it shall not be considered a sole provider of the goods and/or services described herein and that the County may contract with other providers of such goods and/or services if the County deems, at its sole discretion, that multiple providers of the same goods and/or services will serve the best interest of the County.

4.17 FORCE MAJEURE

If the party obligated to perform is prevented from performance by an act of war, order of legal authority, act of God, or other unavoidable cause not attributable to the fault or negligence of said party, the other party shall grant such party relief from the performance. The burden of proof for the need of such relief shall rest upon the party obligated to perform. To obtain release based on force majeure, the party obligated to perform shall file a written request with the other party.

4.18 SEVERABILITY

If any provision of this RFCSP, the Contract or any Ensuing Agreement(s) shall be held invalid or unenforceable by any court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provision thereof, but rather the entire RFCSP, Contract or any Ensuing Agreement(s) will be construed as if not containing the particular invalid or unenforceable provision or provisions, and the rights and obligation of the parties shall be construed and enforced in accordance therewith. The parties acknowledge that if any provision of this RFCSP, the Contract or any Ensuing Agreement(s) is determined to be invalid or unenforceable, it is the desire and intention of each that such provision be reformed and construed in such a manner that it will, to the maximum extent practicable, give effect to the intent of this RFCSP, the Contract or any Ensuing Agreement(s) and be deemed to be validated and enforceable.

4.19 EQUAL OPPORTUNITY

Neither party shall discriminate against any employee or applicant for employment because of race, color, sex, religion or national origin.

4.20 NOTICE

Any notice to be given shall be in writing and may be distributed by personal delivery, or by registered or certified mail, return receipt requested, addressed to the proper party, at the following address:

The County: Williamson County Purchasing Department
Attn: Purchasing Agent
100 Wilco Way, Suite P101

Georgetown, Texas 78626

The Respondent: Address set out in Respondent's Transmittal Letter

Notices given in accordance with this provision shall be effective upon (1) receipt by the party to which notice is given, or (2) on the third (3rd) calendar day following mailing, whichever occurs first.

4.21 SALES AND USE TAX EXEMPTION

The County is a body, corporate and politic, under the laws of the State of Texas and claims exemption from sales and use taxes under Texas Tax Code, Section 151.309, as amended, and the services and/or goods subject hereof are being secured for use by the County.

4.22 COMPLIANCE WITH LAWS

The County and the Successful Respondent shall comply with all federal, state, and local laws, statutes, ordinances, rules and regulations, and the orders and decrees of any courts or administrative bodies or tribunals in any matter affecting the performance of the Contract and any Ensuing Agreement(s), including, without limitation, Workers' Compensation laws, salary and wage statutes and regulations, licensing laws and regulations. When required, the Successful Respondent shall furnish the County with certification of compliance with said laws, statues, ordinances, rules, regulations, orders, and decrees above specified.

4.23 INCORPORATION OF EXHIBITS, APPENDICES AND ATTACHMENTS

All of the Exhibits, Appendices and Attachments referred to herein are incorporated by reference as if set forth verbatim herein. Any conflicting terms in the Contract documents will be resolved at the sole discretion of the Commissioners Court.

4.24 NO WAIVER OF IMMUNITIES

Nothing herein shall be deemed to waive, modify or amend any legal defense available at law or in equity to the County, its past or present officers, employees, or agents, nor to create any legal rights or claim on behalf of any third party. The County does not waive, modify, or alter to any extent whatsoever the availability of the defense of governmental immunity under the laws of the State of Texas and of the United States.

4.25 NO WAIVER

The failure or delay of any party to enforce at any time or any period of time any of the provisions of this RFCSP, the Contract or any Ensuing Agreement(s) shall not constitute a present or future waiver of such provisions nor the right of either party to enforce each and every provision. Furthermore, no term or provision hereof shall be deemed waived and no breach excused unless such waiver or consent shall be in writing and signed by the party claimed to have waived or consented. Any consent by any party to, or waiver of, a breach by the other, whether expressed or implied, shall not constitute a consent to, waiver of or excuse for any other, different or subsequent breach.

4.26 CURRENT REVENUES

The obligations of the parties under the Contract and any Ensuing Agreement(s) do not constitute a general obligation or indebtedness of the County for which the County is obligated to levy, pledge, or collect any of taxation. It is understood and agreed that the County shall have the right to terminate the Contract and any Ensuing Agreement(s) at the end of any the County fiscal year if the governing body of the County does not appropriate sufficient funds as determined by the County's budget for the fiscal year in question. The County may effect such termination by giving written notice of

termination to the Successful Respondent at the end of its then-current fiscal year.

4.27 BINDING EFFECT

This Contract and any Ensuing Agreement(s) shall be binding upon and inure to the benefit of the parties and their respective permitted assigns and successors.

4.28 SAFETY

The Successful Respondent is responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with any services to be provided hereunder. The safety program shall comply with all applicable requirements of the current federal Occupational Safety and Health Act and all other applicable federal, state and local laws and regulations.

4.29 GENERAL OBLIGATIONS AND RELIANCE

The Successful Respondent shall perform all services and/or provide all goods, as well as those reasonably inferable and necessary for completion and provision of services and/or goods required hereunder. The Successful Respondent shall keep the County informed of the progress and quality of the services. The Successful Respondent agrees and acknowledges that the County is relying on the Successful Respondent's represented expertise and ability to provide the goods and/or services described herein. The Successful Respondent agrees to use its best efforts, skill, judgment, and abilities to perform its obligations in accordance with the highest standards used in the profession and to further the interests of the County in accordance with the County's requirements and procedures. The Successful Respondent's duties, as set forth herein, shall at no time be in any way diminished by reason of any approval by the County, nor shall the Successful Respondent be released from any liability by reason of such approval by the County, it being understood that the County at all times is ultimately relying upon the Successful Respondent's skill and knowledge in performing the services and providing any goods required hereunder.

4.30 CONTRACTUAL DEVELOPMENT

The Commissioners Court may award the Contract on the basis of the initial Proposals received, without any further or additional discussions. Therefore, each initial Proposal should contain the Respondent's best terms and offer. The contents of the RFCSP and the selected Proposal will become an integral part of the Contract, but may be modified, at Williamson County's sole discretion, by provisions of an Ensuing Agreement. Therefore, the Respondent must agree to inclusion in an Ensuing Agreement of the Proposal specifications, terms and conditions of this RFCSP. Williamson County and its architect or engineer may discuss with the Successful Respondent options for a scope or time modification and any price change associated with the modification. In the event such discussions are conducted and Williamson County and the Successful Respondent cannot agree to scope or time modifications and any price change associated with such modifications, County may still opt to contract with the Successful Respondent based on selected Respondent's original Proposal to the RFCSP.

The Successful Respondent shall be required to execute a formal contract at Williamson County's offices in Georgetown, Texas within ten (10) days after the award. Said contract shall be in the same form as the Agreement Between Owner and Contractor which begins on the following page. The only anticipated changes in the contract will be to include additional exhibits, to fill in blanks to identify the contractor, and terms relating to the compensation, or to revise the contract to accommodate corrections, changes in the scope of services, or changes pursuant to addenda issued. Respondents should raise any questions regarding the terms of the contract, or submit requested changes in said terms, in the form of written questions or submittals. Because the signed contract will be substantively and substantially derived from the attached contract, each Respondent is urged to seek independent legal counsel as to any questions about the terms, conditions or

provisions contained in the attached contract before submitting a Proposal. Again, the attached contract contains important legal provisions and is considered part and parcel of this RFCSP. Failure or refusal to sign aforesaid contract shall be grounds for Williamson County to revoke any award which has been issued, forfeit security, if applicable, and select another Respondent.

4.31 ENTIRE AGREEMENT

The Contract and any Ensuing Agreement(s) shall supersede all prior Agreements, written or oral between the Successful Respondent and the County and shall constitute the entire Agreement and understanding between the parties with respect to the services and/or goods to be provided. Each of the provisions herein shall be binding upon the parties and may not be waived, modified, amended or altered, except by writing signed by the Successful Respondent and the County.

4.32 SURVIVABILITY

All applicable agreements that were entered into between the Successful Respondent and the County, under the terms and conditions of the Contract and/or any Ensuing Agreement(s), shall survive the expiration or termination thereof for ninety (90) days unless a new contract has been awarded.

The County may exercise, by written notice to the Successful Respondent no later than ten (10) calendar days of the Contract expiration, this clause for emergency cases only.

4.33 PAYMENT

The County's payment for goods and services shall be governed by the Texas Government Code, Chapter 2251. An invoice shall be deemed overdue the thirty-first (31st) day after the later of the following:

A. The date the County receives the goods under the Contract;
B. The date the performance of the service under the Contract is completed; or
C. The date the Williamson County Auditor receives an invoice for the goods or services.

Interest charges for any overdue payments shall be paid by the County in accordance with Texas Government Code, Section 2251.025. More specifically, the rate of interest that shall accrue on a late payment is the rate in effect on September 1 of the County's fiscal year in which the payment becomes due. The said rate in effect on September 1 shall be equal to the sum of one (1) percent and the prime rate published in the Wall Street Journal on the first (1st) day of July of the preceding fiscal year that does not fall on a Saturday or Sunday.

In the event that an error appears in an invoice submitted by the Successful Respondent, the County shall notify the Successful Respondent of the error not later than the twenty-first (21st) day after the date the County receives the invoice. If the error is resolved in favor of the Successful Respondent, the Successful Respondent shall be entitled to receive interest on the unpaid balance of the invoice submitted by the Successful Respondent beginning on the date that the payment for the invoice became overdue. If the error is resolved in favor of the County, the Successful Respondent shall submit a corrected invoice that must be paid in accordance within the time set forth above. The unpaid balance accrues interest as provided by the Texas Government Code, Chapter 2251, if the corrected invoice is not paid by the appropriate date.

As a minimum, invoices shall include:

A. Name, address, and telephone number of the Successful Respondent and similar information in the event the payment is to be made to a different address.

B. The County Contract, Purchase Order.

C. Identification of items or service as outlined in the Contract.

D. Quantity or quantities, applicable unit prices, total prices and total amount.

E. Any additional payment information which may be called for by the Contract.

Payment inquiries should be directed to the following address:

Williamson County Auditor's Office, Accounts Payable Department
Email: accountspayable@wilco.org
Phone: 512-943-1500

4.34 CONTRACTUAL FORMATION AND ENSUING AGREEMENT

The RFCSP and the Respondent's Proposal, when properly accepted by the Commissioners Court, shall constitute a Contract equally binding between the Successful Respondent and the County. The Successful Respondent may be required by Williamson County to sign an additional Agreement containing terms necessary to ensure compliance with the RFCSP and Respondent's Proposal.

4.35 LEGAL LIABILITY INFORMATION

The Successful Respondent shall disclose all legal liability information by listing any pending litigation, civil or criminal, or anticipated litigation that your firm is involved in including, but not limited to, potential or actual legal matters with private parties and any local, state, federal or international governmental entities. Furthermore, the respondent certifies to the best of its knowledge and belief that within the last five (5) years Respondent or Respondent Related Entities have not: a. been indicted or convicted of a crime involving moral turpitude or business honesty or integrity in any jurisdiction; b. been suspended, debarred or otherwise disqualified from entering into any contract with any governmental agency; c. had any business license or professional license suspended or revoked; d. had any sanction or finding of fact imposed as a result of a judicial or administrative proceeding related to fraud, extortion, bribery, bid rigging, embezzlement, misrepresentation or anti-trust; and e. been, and is not currently, the subject of a criminal investigation by any federal, state or local prosecuting or investigative agency and/or civil anti-trust investigation by any federal, state or local prosecuting or investigative agency. If Respondent cannot so certify to the above, then it must submit along with its proposal, proposal or contract a written explanation of why such certification cannot be made. The Commissioner's Court will determine whether a contract may be entered into with the Respondent. The Respondent's obligation pursuant to this certification is ongoing from and after the effective date of the contract through the termination date thereof. Accordingly, the Respondent shall have an obligation to immediately notify the Purchasing Department in writing if at any time during the term of the contract if becomes aware of any event which would cause the Respondent's certification or explanation to change. Respondent acknowledges that the Commissioner's Court may, in its sole discretion, terminate the contract for cause if it learns that any of the certifications made herein are currently false due to intervening factual circumstances or were false or should have been known to be false when entering into the contract. The County reserves the right to consider legal liability information in the recommendation of any proposed contract to the Commissioners Court.

4.36 CONFIDENTIALITY

Respondent expressly agrees that it will not use any direct or incidental confidential information that may be obtained while working in a governmental setting for its own benefit, and agrees that it will not access unauthorized areas or confidential information and it will not disclose any information to

unauthorized third parties, and will take care to guard the security of the information at all times.

4.37 INCLEMENT WEATHER

In case of inclement weather or any other unforeseen event causing the County to close for business on the date of a Proposal submission deadline, the Proposal closing will automatically be postponed until the next business day the County is open. If inclement weather conditions or any other unforeseen event causes delays in carrier service operations, the County may issue an Addendum to all known Respondents interested in the project to extend the deadline. It will be the responsibility of the Respondent to notify the County of their interest in the project if these conditions are impacting their ability to turn in a submission within the stated deadline. The County reserves the right to make the final judgement call to extend any deadline.

4.38 AIR QUALITY

In determining the overall best Proposal, the County may, to the extent applicable, exercise the option granted to local governments under the Texas Local Government Code, Section 271.907.

This option allows the County to evaluate Proposals and give preference to goods and/or services of a Respondent that demonstrates that the Respondent meets or exceeds any and all state or federal environmental standards, including voluntary standards, relating to air quality. If the Proposal being submitted will have an effect on air quality for the County (as it relates to any state, federal, or voluntary air quality standard), then the Respondent is encouraged to provide information in narrative indicating the anticipated air quality impact. All Respondents are expected to meet all mandated state and federal air quality standards.

4.39 COOPERATIVE PURCHASING PROGRAM

During the term of the Contract resulting from this RFCSP, the County would like to afford the same prices, terms and conditions to other political subdivisions or public entities. Another entity's participation in the Contract resulting from this RFCSP is subject to a properly authorized Purchasing Cooperative Inter-local Agreement (ILA) with the County. Any liability created by purchase orders issued against the Contract shall be the sole responsibility of the governmental agency placing the order.

4.40 PREVAILING WAGE RATES

To the extent this procurement is for the construction of a public work, including a building, highway, road, excavation, and repair work or other project development or improvement, paid for in whole or in part from public funds, without regard to whether the work is done under public supervision or direction, Texas Government Code, Chapter 2258, shall apply and 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 County. Pursuant to Texas Government Code, Section 2258.022(a)(2), the County has determined the general prevailing rate of the "Prevailing Wage Schedule" in the locality in which the public work is to be performed for each craft or type of worker needed to execute the contract and the prevailing rate for legal holiday and overtime work by using the prevailing wage rate as determined by the United States Department of Labor in accordance with the United States Code, Section 276a (Davis-Bacon Act).

The specified wage rates are minimum rates only, and are not representations that qualified labor adequate to perform the work is available locally at the prevailing wage rates. The County is not bound to pay—and 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 Documents. 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.

For classifications not shown, workers shall not be paid less than the wage indicated for laborers. The contractor shall notify each worker commencing work on the project 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 by the County, competent evidence of compliance with the Texas Prevailing Wage Law shall be furnished by contractor. A copy of each worker wage rate notification shall be submitted to the County with the Application for Payment for the period during which the worker began on-site activities.

Should the contractor at any time become aware that a particular skill or trade not reflected on the County'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 County and shall specify a wage rate for that skill or trade, which shall bind the contractor.

The contractor and any subcontractor shall pay to the County 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. 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 County.

Within thirty-one (31) days of receipt of information concerning a violation of the Texas Government Code Chapter 2258, the County shall make an initial determination as to whether good cause exists to believe a violation occurred. The County'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 County 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.

After the County makes its initial determination, the affected contractor or subcontractor and worker have fourteen (14) calendar days in which to resolve the issue of whether a violation occurred, including the amount that should be retained by the County 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 County in a written document signed by the worker. It the contractor or Subcontractor and affected worker do not agree before the fifteenth (15^{th}) calendar day after the County's determination, the contractor or subcontractor and affected worker must participate in binding arbitration in accordance with the Texas General Arbitration Act, Chapter 171, (Texas Civil Practice and Remedies Code). The parties to the arbitration have ten (10) calendar days after the expiration of the fifteen (15) calendar days referred to above, to agree on an arbitrator; if by the eleventh (11^{th}) calendar 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.

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 above and the amount owed the worker. The County may use any amounts retained hereunder to pay the worker the amount as designated in the arbitration award. If the County 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, attorneys' fees and court costs. The contractor shall promptly furnish a copy of the arbitration award to the County.

Money retained pursuant to the provisions above 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 sixty dollars ($60.00) per calendar day of violation per worker shall be retained by Williamson County to offset its administrative costs, pursuant to Texas Government Code, Section, 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 County 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 the provision herein-above.

4.41 CONFIDENTIALITY

The Respondent expressly agrees that it will not use any direct or incidental confidential information that may be obtained while working in a governmental setting for its own benefit, and agrees that it will not access unauthorized areas or confidential information and it will not disclose any information to unauthorized third parties, and will take care to guard the security of the information at all times.

Additional Stipulations

1 Additional Stipulations

1.1 Introduction

The Proposal evaluation and selection process is detailed in this section, as are other factors, and the format in which the Price Proposal of each Proposal should be submitted.

1.2 Price Proposal

The Respondent must submit pricing as provided in RFCSP. The Price Proposal should be included in each copy of the Proposal if submitted in paper form.

1.3 Proposal Evaluation and Selection

1.3.1 Evaluation/Selection Criteria

All Proposals received by the designated date and time will be evaluated based on the Respondent's Proposal. Other information may be taken into consideration when that information potentially provides an additional benefit to the County, and further helps the County in receiving the services listed in the RFCSP.

Respondents' Proposals must meet all mandatory (minimum) requirements in order to be scored. Scoring may also be based on total information gathered by the County at its discretion, including but not limited to respondent's ability to perform "without delay or interference, character, responsibility, integrity, and experience or demonstrated capability; quality of prior work; compliance with laws; and noncompliance with requirements as to submission of relevant information."

1.3.2 Evaluation Committee and Selection Process

All Proposals will be evaluated by a County appointed Evaluation Committee. The Evaluation Committee may be composed of County Staff that may have expertise, knowledge or experience with the services and/or goods being procured hereunder. Those Respondents meeting all requirements and deemed most qualified may receive further evaluation via telephone or in-person interviews with members of the Evaluation Committee. The County will select a Respondent determined best and most responsible Respondent meeting minimum specifications and qualifications.

Respondents are advised that the Evaluation Committee, at its option, may recommend an award strictly on the basis of the initial RFCSP responses, or in addition, may have interviews with firms to determine its final recommendation. The Evaluation Committee will present its recommendation to the Williamson County Commissioners' Court for approval and award of contract.

Finalist shall be determined by the Respondent receiving the most points in relation to the following Evaluation Criteria. Additional scoring may be conducted based upon Respondent's presentation during the interview process and may or may not include previous scores from Respondent's Proposal.

1.3.3 Mandatory Criteria

Minimum requirements must be passed in order to be considered for scoring as described in section 1.3.4

1.3.4 Graded Evaluation Factors

The following graded evaluation factors will be used to determine how well a Respondent(s) meet(s) the desired performance

1. **Price – 40%**
    a. **Submit pricing per price sheet**
2. **Respondent's experience and reputation – 30%**
    a. **Respondent to provide a list of 3 similar (or larger) projects performed in Texas. Please include project name, owner contact name & contact information, brief project description with size/square footage and contracted dollar amount.**
3. **Respondent's proposed personnel for the project – 20%**
    a. **Respondent to provide list of proposed staff to be used on the project. Provide names of Company Owner, Project Manager, Superintendent, Etc. and/or equivalents.**
4. **Respondent's office location as it relates to distance from the project site. – 10%**
    a. **Provide verifiable physical address of Respondent's closest permanent location to project and length of time at that location.**

1.3.5 Interviews

Interview scoring (if applicable) will be provided along with invitation to interview candidates.

1.3.6 Additional Evaluation Information

The County reserves the right to award a contract for any or all areas of this RFCSP.

It is the responsibility of the Respondent to provide sufficient information/data in a convincing manner to the County to assure all of the terms, conditions and expectations for satisfactory performance of the services requested herein will be met.

All contact during the evaluation phase shall be through the Williamson County Purchasing Department only. The Respondent shall neither contact nor lobby evaluators during the evaluation process. Attempts by the Respondent to contact and/or influence members of the Evaluation Committee may result in disqualification of Proposal.

1.4 Technical Contact

Dwayne Gossett, Facilities Project Manager (or successor), Williamson County, TX shall serve as the County's Technical Contact with designated responsibility to ensure compliance with the requirements of the Contract and any ensuing agreement, such as but not limited to, acceptance, inspection and delivery, together with the Purchasing Department. The Technical Contact, together with the Purchasing Department, will serve as liaison between Williamson County Commissioners Court and the Successful Respondent.

1.5 Time for Performance

A time frame of two hundred seventy (270) days (two hundred forty (240) to substantial completion / thirty (30) to final completion) is given for completion of plans on this bid. This may begin at the time specified by the County within the three hundred sixty-five (365) days of the pricing quoted on this bid, starting on the day of award. The Contractor will be given written notice to begin work on this project. The Work on this project shall begin within five (5) calendar days after such notification.

Liquidated damages for failure to substantially complete the work within the allotted time will be applied. Liquidated damages are $1000 per working day.

The Contractor will be given written notice to begin work on this project. Work on this project shall begin within five (5) working days after such notification. Failure to begin work within the allotted time will result in liquidated damages being incurred at the rate of $1000 per working day.

1.6 Performance and Payment Bonds

To the extent, this RFCSP is for the procurement of a public work contract, and the following shall apply:

Texas Local Government Code, Chapter 262.032, governs the requirements for performance bonds for government entities making public work contracts. A performance bond is required if the contract is in excess of $50,000 and is to be made for the full amount of the contract.

Texas Government Code, Chapter 2253.021, governs the requirements for payment bonds for government entities making public work contracts. A payment bond is required if the contract is in excess of $25,000 and is to be made for the full amount of the contract.

The bonds are to be executed and delivered to the County **prior to issuing Notice to Proceed**. The bonds must be executed by a corporate surety or sureties in accordance with the Texas Insurance Code. For unit price contracts, the total contract price shall be estimated and calculated by multiplying the estimated quantities to the Bidder's unit bid price.

If the public works contract is less than $50,000, the performance bond will not be required as long as the contract provides that payment is not due until the work is completed and accepted by the County.

1.7 Bidder's Bonds

All Bids requiring a Bid Bond shall be accompanied by a certified cashier's check upon a National or State bank in an amount not less than five (5) percent of the total maximum bid price, payable without recourse to the County, or a bid bond in the same amount from a reliable surety company, as a guarantee that the Bidder will enter into a contract and **execute and deliver to the County performance and payment bonds prior to being recommended for award of the Contract**. **Bid guarantees must be submitted in the same sealed envelope with the Bid**. Bids submitted without check or bid bonds will not be considered. For unit price contracts, the total maximum bid price shall be estimated and calculated by multiplying the estimated quantities to the unit bid price.

1.8 Warranty Bonds

When a Warranty Bond is required it shall be submitted by the Successful Bidder prior to issuing Notice to Proceed, and shall be in the amount of **twenty (20) percent of the total project construction cost.** This Warranty Bond shall be security for the true and faithful performance of all warranties for two (2) years from the date of final payment. For unit price contracts, the total project construction cost shall be estimated and calculated by multiplying the estimated quantities to the bidder's unit bid price.

1.9 Insurance Requirements

By signing its Bid, the Bidder agrees to maintain at all times during any term of the Contract and any ensuing Agreement at Bidder's cost, insurance in accordance with this provision.

Bidder will be required to submit Certificates of Insurance **prior to contract award and any renewals.**

All certificates of insurance coverage as specified below must be provided to the following location:

Williamson County Purchasing Department
100 Wilco Way, Suite P101
Georgetown, Texas 78626

Failure to comply with these Insurance Requirements may result in the termination of the Contract and any ensuing Agreement(s) between the Successful Bidder and County. The following coverage limits shall be required at a minimum:

A.	Worker's Compensation	Statutory – Texas Law
B.	Employer's Liability:	
	Bodily Injury by Accident	$500,000 Ea. Accident
	Bodily Injury by Disease	$500,000 Ea. Employee
	Bodily Injury by Disease	$500,000 Policy Limit

C. Comprehensive general liability including completed operations and contractual liability insurance for bodily injury, death, or property damages in the following amounts:

COVERAGE	PER PERSON	PER OCCURRENCE
Comprehensive General Liability	$1,000,000	$1,000,000

Aggregate policy limits: $2,000,000

Successful Bidder's property will not be covered by any insurance that may be carried by the County. Successful Bidder assumes the risk of loss on its contents and property that are situated on/in/around the County property. The Successful Bidder is strongly encouraged to obtain insurance on its property to the extent deemed necessary by the Successful Bidder.

The deductible for an insurance policy required hereunder shall not exceed $100,000. **The County shall be named as an additional insured under any policy of insurance required hereunder.**

Successful Bidder shall not commence any work until it has obtained all required insurance and such insurance has been approved by County. Successful Bidder shall not allow any subcontractor(s) to commence work to be performed until all required insurance has been obtained by such subcontractor(s) and approved by County. Approval of the insurance by County shall not relieve or decrease the liability of Successful Bidder or its subcontractor(s) hereunder.

The required insurance must be written by a company approved to do business in the State of Texas with a financial standing of at least an A- rating, as reflected in Best's insurance ratings or by a similar rating system recognized within the insurance industry at the time the policy is issued. Successful Bidder shall furnish County with a certificate of coverage issued by the insurer. Successful Bidder shall not cause any insurance to be canceled nor permit any insurance to lapse. ALL INSURANCE CERTIFICATES SHALL INCLUDE A CLAUSE TO THE EFFECT THAT THE POLICY SHALL NOT BE CANCELED OR REDUCED, RESTRICTED OR LIMITED UNTIL TEN (10) CALENDAR DAYS AFTER COUNTY HAS RECEIVED WRITTEN NOTICE AS EVIDENCED BY RETURN RECEIPT OF REGISTERED OR CERTIFIED LETTER.

It is the intention of the County, and agreed to and hereby acknowledged by the Successful Bidder, that no provision of this Contract or any ensuing Agreement shall be construed to require the County to submit to mandatory arbitration or mediation in the settlement of any claim, cause of action or dispute, except as specifically required in direct connection with an insurance claim or threat of claim under an insurance policy required hereunder which absolutely requires arbitration or mediation of such claim, or as otherwise required by law or a court of law with jurisdiction over the provisions of this Contract or any ensuing Agreement.

Workers' Compensation Coverage Requirements

The Texas Labor Code, Section 406.096, requires workers' compensation insurance coverage for all persons providing services on a building or construction project for a governmental entity such as the County. The rule requires the County to timely obtain certificates of coverage and retain them for the duration of the project. The rule also sets out the language to be included in the Bid specifications and in contracts awarded by a governmental entity and the information required to be in the posted notice to employees. The rule is adopted under the Texas Labor Code, Section 402.061.

The information provided below is a result of this rule. By submitting your Bid to the County, you are acknowledging that this rule is a part of these Bid specifications, and that you will observe and abide by all of the requirements outlined in the rule. You are further agreeing that should your Bid be accepted by the Williamson County Commissioners Court, the necessary certificates of coverage showing workers' compensation coverage, will be provided to the following name and address prior to beginning work:

Williamson County Purchasing Department
100 Wilco Way, Suite P101
Georgetown, TX 78626

Failure to comply with this request may result in termination of the Contract and any ensuing Agreement. If you have any questions related to this ruling and/or requirement, you are encouraged to contact either the Williamson County Purchasing Department at (512) 943-1546, or you may call the Texas Workers' Compensation Commission at (800) 372-7713.

A. The following words and terms, when used in this provision, shall have the following meanings. Terms not defined in this rule shall have the meaning defined in the Texas Labor Code, if so defined.

1. Certificate of coverage (certificate) – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a workers' compensation coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees (including those subject to a coverage agreement) providing services on a project, for the duration of the project.

2. Building or Construction – Has the meaning defined in the Texas Labor Code, Section 406.096(e)(1).

3. Contractor – A person bidding for or awarded a building or construction project by Williamson County.

4. Coverage – Workers' compensation insurance meeting the statutory requirements of the Texas Labor Code, Section 401.011(44).

5. Coverage agreement – A written agreement on form TWCC-81, form TWCC-82, form TWCC-83, or form TWCC-84, filed with the Texas Workers' Compensation Commission which establishes a relationship between the parties for purposes of the Texas Workers' Compensation Act, pursuant to the Texas Labor Code, Chapter 406, Subchapters F and G, as one of employer/employee and establishes who will be responsible for providing workers' compensation coverage for persons providing services on the project.

6. Duration of the project--Includes the time from the beginning of work on the project until the work on the project has been completed and accepted by the County.

7. Persons providing services on the project ("subcontractor" in the Texas Labor Code, Section 406.096) – includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

8. Project – Includes the provision of all services related to a building or construction contract for the County.

B. The contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of the Texas Labor Code, Section 401.011(44), for all employees of the contractor providing services on the project, for the duration of the project.

C. The Contractor must provide a certificate of workers compensation coverage to Williamson County prior to being awarded the Contract.

D. If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with Williamson County showing that coverage has been extended.

E. The contractor shall obtain from each person providing services on a project, and provide to the County:

1. A certificate of coverage, prior to that person beginning work on the project, so Williamson County will have on file certificates of coverage showing coverage for all persons providing services on the project; and

2. No later than seven days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

F. The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

G. The contractor shall notify the County in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

H. The contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

I. The contractor shall contractually require each person with whom it contracts to provide services on a project, to:

1. Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44), for all of its employees providing services on the project, for the duration of the project;

2. Provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;

3. Provide the contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

4. Obtain from each other person with whom its contracts, and provide to the contractor:

    i. (a) a certificate of coverage, prior to the other person beginning work on the project; and
    ii. (b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

5. Retain all required certificates of coverage on file for the duration of the project and for one year thereafter;

6. Notify the County in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

7. Contractually require each person with whom it contracts, to perform as required by paragraphs 1 – 7, with the certificates of coverage to be provided to the person for whom they are providing services

J. By signing this Contract or providing or causing to be provided a certificate of coverage, the contractor is representing to Williamson County that all employees of the contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

K. The contractor's failure to comply with any of these provisions is a breach of Contract by the contractor which entitles the County to declare the contract void if the contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the County.

WILLIAMSON COUNTY - JUSTICE CENTER - I.T. SERVER BUILDING

405 MARTIN LUTHER KING DR.
GEORGETOWN, TX 78626

18465.01

05/23/2019

CONSTRUCTION DOCUMENTS

WILLIAMSON COUNTY
1848

ARCHITECT

kga

9075 West Diablo Drive, Suite 300
Las Vegas, Nevada 89148
702.367.6000

Las Vegas

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Las Vegas, Nevada 89148
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Austin

www.kga.design

Contact: LUMA JAFFAR

CONSULTANTS

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AUSTIN, TX 78746
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CONTACT: ELIAS HADDAD

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CONTACT: DANIEL GRANT

MECHANICAL / PLUMBING / ELECTRICAL:
AGNEW ASSOCIATES, INC.
14205 BURNET RD, SUITE 200
AUSTIN, TX 78728
T: 512-828-0753

CONTACT: DONALD SMITH

COMcheck Software Version 4.1.1.0

Envelope Compliance Certificate

Project Information

Energy Code:	2015 IECC
Project Title:	WILLIAMSON COUNTY I.T. SERVER BUILDING
Location:	Georgetown, Texas
Climate Zone:	2a
Project Type:	New Construction

Construction Site:	Owner/Agent:	Designer/Contractor:
405 MARTIN LUTHER KING DR, GEORGETOWN, TX 78626	BOB DAIGH WILLIAMSON COUNTY GEORGETOWN, TX 78626 512-943-3330 BDAIGH@WILCO.ORG	Luma Jaffar kga 1701 Directors Blvd Ste 770 Austin, TX 78744 512-441-8200 luma@kga.design

Additional Efficiency Package(s)

High efficiency HVAC. Systems that do not meet the performance requirement will be identified in the mechanical requirements checklist report.

Building Area	Floor Area
1-SERVER/DATA STORAGE (Warehouse) : Nonresidential	1667

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Floor 1: Slab-On-Grade:Unheated, [Bldg. Use 1 - SERVER/DATA STORAGE] (b)	140	---	---	0.730	0.730
Roof 1: Insulation Entirely Above Deck, High Albedo Roof Required, 3-Year-Aged Solar Reflectance Index = 82.00 (c), [Bldg. Use 1 - SERVER/DATA STORAGE]	1667	---	25.0	0.039	0.039
NORTH					
Exterior Wall 1: Concrete Block:8", Solid Grouted, Normal Density, Furring: Metal, [Bldg. Use 1 - SERVER/DATA STORAGE]	700	0.0	10.2	0.077	0.151
Door 1: Insulated Metal, Swinging, [Bldg. Use 1 - SERVER/DATA STORAGE]	32	---	---	0.480	0.610
EAST					
Exterior Wall 7: Concrete Block:8", Solid Grouted, Normal Density, Furring: Metal, [Bldg. Use 1 - SERVER/DATA STORAGE]	280	0.0	10.2	0.077	0.151
SOUTH					
Exterior Wall 5: Concrete Block:8", Solid Grouted, Normal Density, Furring: Metal, [Bldg. Use 1 - SERVER/DATA STORAGE]	700	0.0	10.2	0.077	0.151
WEST					
Exterior Wall 2: Solid Concrete:8" Thickness, Normal Density, Furring: Metal, [Bldg. Use 1 - SERVER/DATA STORAGE]	280	0.0	10.2	0.078	0.151

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.
(b) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.

(c) High albedo roof requirement options: 1) 3-year aged solar reflectance >= 0.55 thermal emittance >= 0.75, 2) 3-year aged solar reflectance index >= 64.0, 3) Initial year aged solar reflectance >= 0.70 thermal emittance >= 0.75, 4) Initial year aged solar reflectance index >= 82.0.

Envelope PASSES: Design 31% better than code

Envelope Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed envelope systems have been designed to meet the 2015 IECC requirements in *COMcheck* Version 4.1.1.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Luma Jaffar, AIA — Name - Title
Signature
05-22-2019 — Date

SHEET INDEX

SHEET No.	SHEET NAME
GENERAL	
AG0.00	COVER
AG0.01	SHEET INDEX, CODE ANALYSIS & EGRESS PLAN
AG0.02	2012 TEXAS ACCESSIBILITY STANDARDS
CIVIL	
C1.01	DEMOLITION SITE PLAN
C2.01	SITE, GRADING AND EROSION CONTROL PLAN
C3.01	CONSTRUCTION DETAILS
ARCHITECTURAL	
ASD 1.01	ARCHITECTURAL SITE PLAN - DEMO
AS1.01	OVERALL ARCHITECTURAL SITE PLAN
AS1.02	ENLARGED SITE PLAN
AS2.01	SITE DETAILS
A1.01	FLOOR PLAN & REFLECTED CEILING PLAN
A2.01	FINISH FLOOR PLAN
A2.11	DOOR SCHEDULE & DOOR DETAILS
A4.01	ROOF PLAN
A4.01A	ROOF PLAN ALTERNATE
A6.01	EXTERIOR ELEVATIONS
A7.01	BUILDING SECTIONS
A7.10	WALL SECTIONS
A7.11	WALL SECTIONS
A7.20	BUILDING DETAILS
A7.20A	ALTERNATE BUILDING DETAILS
A9.01	MISCELLANEOUS DETAILS
S0.00	GENERAL NOTES
S0.01	GENERAL NOTES
S0.02	GENERAL NOTES
S0.02A	GENERAL NOTES - ALTERNATE 1
S0.03	OVERALL 3D VIEW
S0.03A	OVERALL 3D VIEW ALTERNATE 1
S1.10	FOUNDATION PLAN AND ROOF PLAN
S1.10A	FOUNDATION PLAN AND ROOF PLAN ALTERNATE 1
S3.01	TYPICAL CMU DETAILS AND SCHEDULES
S4.01	TYPICAL CMU DETAILS AND SCHEDULES
S5.01	TYPICAL CONNECTION DETAILS
S5.02	STEEL ROOF FRAMING SECTIONS AND DETAILS
M0.01	MECHANICAL DETAILS & SCHEDULES
M2.01	FLOOR PLAN - MECHANICAL - AREA A
FP0.01	FIRE PROTECTION GENERAL NOTES & DETAILS
E0.00	ELECTRICAL SITE PLAN
E0.01	ELECTRICAL LEGEND & SCHEDULES
E0.02	ELECTRICAL DETAILS
E0.03	ELECTRICAL RISER DIAGRAM
E2.01	FLOOR PLAN - LIGHTING
E3.01	FLOOR PLAN - POWER & COMMUNICATIONS
E4.01	FLOOR PLAN - HVAC POWER
T0.01	LEGEND AND NOTES - COMMUNICATIONS
T1.01	SITE PLAN - COMMUNICATIONS
T2.01	FLOOR PLAN - COMMUNICATIONS
T7.01	SERVER ROOM DETAILS - COMMUNICATIONS
T9.01	GENERAL DETAILS - COMMUNICATIONS
SC0.01	LEGEND AND NOTES - SECURITY
SC2.01	FLOOR PLAN - SECURITY
SC9.01	GENERAL NOTES - SECURITY

SYMBOL LEGEND

DOOR (101) — WINDOW (1t) — REVISION (1)

KEY NOTE (?)

KEY NOTE PREFIX
S = SITE
D = DEMOLITION
P = PLAN
TA = TOILET ACCESSORIES
EQ = EQIPMENT
C = CEILING
R = ROOF
E = EXT. ELEVATION
IE = INT. ELEVATION

PARTITION TYPE

PARTITION SUFIX
S = SOUND INSULATION

REFER TO PARTITION TYPE DETAILS

Room name
NAME
101
ROOM TAG — EXISTING GRID (0) — NEW GRID (0)

SECTION: 1 / A101 — SIM — SECTION NUMBER — SHEET NUMBER

DETAIL: 1 / A101 — SIM — DETAIL NUMBER — SHEET NUMBER

ELEVATION: 1 / A101 / 1 / 1 — ELEVATION NUMBER — SHEET NUMBER

ALTERNATES

ALTERNATE 1:

ALTERNATE 1 INCLUDES THE REPLACEMENT OF STANDARD STRUCTURAL SYSTEMS WITH HARDENED STRUCTURAL SYSTEMS TO ACHIEVE AN EF3 STORM RATING AS INDICATED ON STRUCTURAL DRAWINGS. HARDENED STRUCTURAL SYSTEMS INCLUDE EXTERIOR WALLS, YARD WALLS, AND ROOF ASSEMBLIES. THIS ALTERNATE ALSO INCLUDES THE ADDITION OF A REMOVABLE GRATE OVER THE MECHANICAL YARD, AS PART OF THIS ALTERNATE, STANDARD EXTERIOR DOORS AND LOUVERS ARE ALSO TO BE REPLACED WITH STORM RATED DOORS AND LOUVERS AS INDICATED ON SCHEDULES AND IN SPECIFICATIONS.

CODE ANALYSIS

APPLICABLE CODES:
2012 INTERNATIONAL BUILDING CODE (IBC)
2012 INTERNATIONAL MECHANICAL CODE (IMC)
2012 INTERNATIONAL PLUMBING CODE (IPC)
2014 NATIONAL ELECTRIC CODE (NEC)
2012 INTERNATION FIRE CODE (IFC)
2012 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
2010 TEXAS ACCESSIBILITY STANDARDS (TAS)

BUILDING INFORMATION:

TYPE OF CONSTRUCTION (FULLY SPRINKLERED)	IIIA
ALLOWABLE BUILDING AREA	104,000 SF
ALLOWABLE BUILDING HEIGHT	85'-0"
ALLOWABLE STORIES	4
ACTUAL BUILDING AREA	1,667 SF
ACTUAL BUILDING HEIGHT	14'-0"
ACTUAL BUILDING STORIES	1

OCCUPANCY INFORMATION:

OCCUPANCY CLASSIFICATION	S-1

FIRE RESISTIVE RATINGS:

PER TABLES 601 & 602

STRUCTURAL FRAME	1 HOUR
EXTERIOR BEARING WALLS	2 HOUR
INTERIOR BEARING WALLS	1 HOUR
INTERIOR ROOM DIMISING WALLS	0 HOUR

FIRE PROTECTION:

SPRINKLER SYSTEM:
BUILDING IS EQUIPPED THROUGHOUT WITH AN ELECTRICALLY SUPERVISED WET AUTOMATIC SPRINKLER. CONTRACTOR SHALL PROTECT EXISTING FIRE SPRINKLER SYSTEM DURING CONSTRUCTION.

FIRE ALARM SYSTEM:
EXISTING AUTOMATIC FIRE ALARM SYSTEM INSTALLED THROUGHOUT PER NFPA. CONTRACTOR SHALL PROTECT EXISTING FIRE ALARM SYSTEM DURING CONSTRUCTION.

FIRE EXTINGUISHERS:
FIRE EXTINGUISHERS ARE LOCATED SUCH THAT THE TRAVEL DISTANCE TO THE NEAREST EXTINGUISHER WILL BE A MAXIMUM OF 75 FEET. FIRE EXTINGUISHERS SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH NFPA 10.

FIRE COMMAND CENTER: NOT REQUIRED

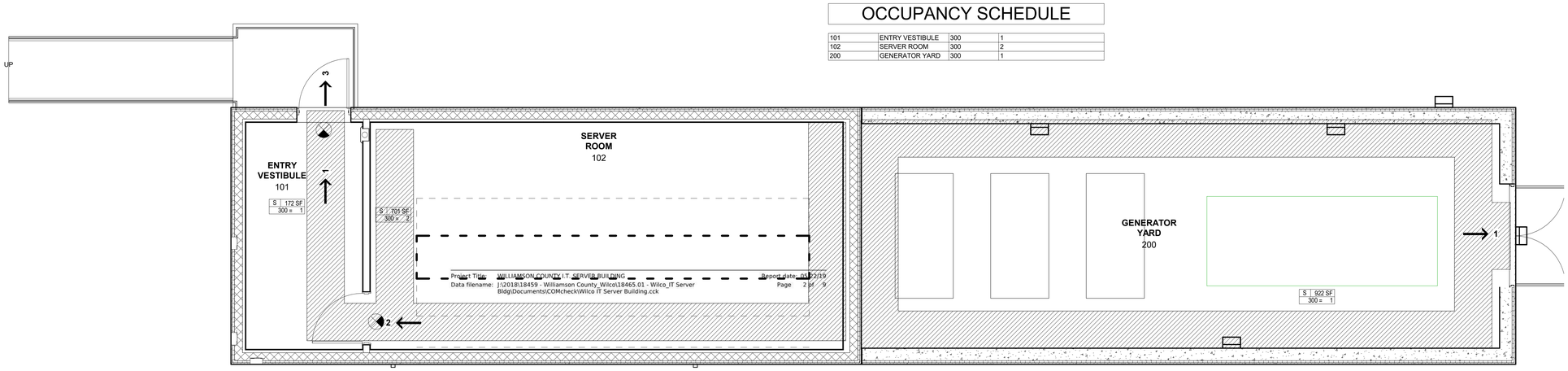
EXITING REQUIREMENTS:

TRAVEL DISTANCE (OCC S-1)	250' MAX
MIN. EGRESS WIDTH (LEVEL)	0.2" PER OCCUPANT
MIN. EGRESS WIDTH (STAIR)	0.3" PER OCCUPANT
DEAD END CORRIDOR	50' MAX
REQUIRED EXITS	1
PROVIDED EXITS	1

EXIT SIGNS:
ALL ROOMS AND SPACES REQUIRED TO HAVE MORE THAN ONE EXIT OR EXIT ACCESS SHALL BE PROVIDED WITH EXIT SIGNS. EXIT SIGNS SHALL BE LOCATED AT EACH EXIT DOOR AND EXIT ACCESS AREAS SO AS TO BE READILY VISIBLE. SIGN PLACEMENT SHALL BE SUCH THAT ANY POINT IN AN EXIT ACCESS SHALL NOT BE MORE THAN 100 FEET FROM THE NEAREST VISIBLE SIGN.

OCCUPANCY SCHEDULE

101	ENTRY VESTIBULE	300	1
102	SERVER ROOM	300	2
200	GENERATOR YARD	300	1



EGRESS PLAN

SCALE: 1/4" = 1'-0"

1

ABBREVIATONS

&	AND
@	AT
ALUM	ALUMINUM
B.O.D.	BOTTOM OF DECK
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CFOI	CONTRACTOR FURNISHED, OWNER INSTALLED
CG	CORNER GUARD
CJ	CONTROL JOINT
CLG	CEILING
CORR	CORRIDOR
DEPT	DEPARTMENT
DIA	DIAMETER
DS	DOWN SPOUT
EQ	EQUAL
EJ	EXPANSION JOINT
EXIST	EXISTING
FEC	FIRE EXTINGUISHER CABINET
HB	HOSE BIB
HM	HOLLOW METAL
LAB	LABORATORY
MAX	MAXIMUM
MIN	MINIMUM
MISC	MISCELLANEOUS
M.O.	MASONRY OPENING
NIC	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
OCC	OCCUPANCY
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
O.H.	OPPOSITE HAND
REC	RECEPTION
REF	REFRIGERATOR
RM	ROOM
RO	ROUGH OPENING
SIM	SIMILAR
STOR	STORAGE
TLT	TOILET
T.O.W.	TOP OF WALL
TV	TELEVISION
TYP	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE

MATERIAL LEGEND

EARTH
CONCRETE
CONCRETE MASONRY
METAL
PLYWOOD
FINISH WOOD
BATT INSULATION
RIGID INSULATION

EGRESS LEGEND

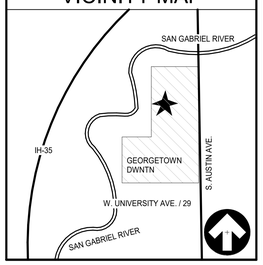
OCCPANCY TYPE — Typ#. 150 SF Area per =Occ — ROOM SIZE
AREA PER OCCUPANT — OCCUPANT LOAD

EGRESS ROUTE
8 — EGRESS DIRECTION WITH COMBINED OCCUPANT NUMBER
EXIT SIGN
FEC — FIRE EXSTINGUISHER CABINET

ACCESSABILITY COMPLIANCE

ACCESS PER I.B.C. CHAPTER 11 AND (ADA) AMERICANS WITH DISABILITIES ACT. WITH SPECIFIC RESPECT TO DESIGN REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT OF 1990, OR CERTIFIED STATE OR LOCAL ACCESSIBILITY REGULATION (ADA), WE REPRESENT THAT OUR DRAWINGS AND SPECIFICATIONS HAVE BEEN PREPARED IN THE REGULAR COURSE OF OUR ROFESSIONAL SERVICE TO THE BEST OF OUR KNOWLEDGE IN CONFORMANCE WITH KNOWN, PUBLISHED, AND PREVAILING INTERPRETATION AND PRACTICES AT THE TIME OF DESIGN. OUR INSURANCE CARRIER REQUIRES US TO INCLUDE THE FOLLOWING WORDING IN OUR CONTRACTS AND ON OUR DRAWINGS: COMPLIANCE WITH ADA IS A LEGAL MATTER, NOT A DESIGN RESPONSIBILITY, AND OUR INSURANCE CARRIER PROHIBITS THE USE OF ANY STATEMENT, WRITTEN OR VERBAL, THAT IMPLIES THAT OUR DOCUMENTS COMPLY WITH ADA. THEREFORE, WITH SPECIFIC RESPECT TO DESIGN REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT OF 1990, THE CLIENT UNDERSTANDS THAT INTERPRETATION OF ADA IS A LEGAL ISSUE AND NOT A DESIGN ISSUE, AND RETENTION OF LEGAL COUNSEL FOR PURPOSES OF INTERPOISITION IS ADVISABLE.

VICINITY MAP



REGISTERED ARCHITECT — STATE OF TEXAS
05/23/2019

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512-828-0753
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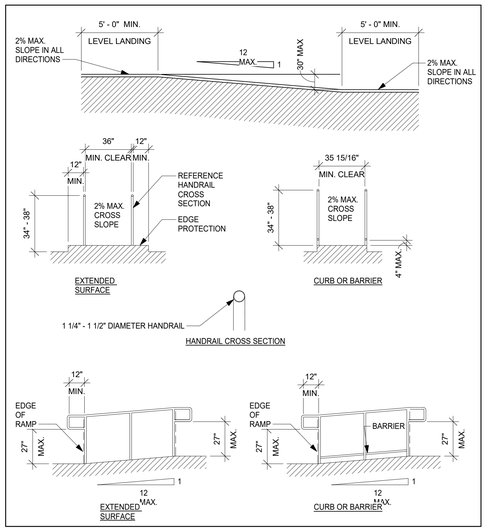
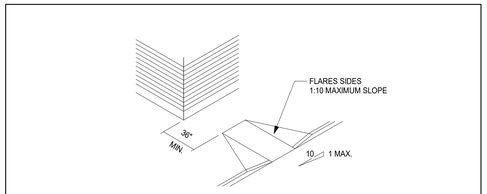
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG
SHEET CONTENTS:
SHEET INDEX, CODE ANALYSIS & EGRESS PLAN
DATE:
05/23/2019
JOB NO.:
18465.01
SHEET:
AG0.01

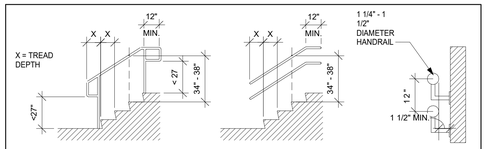
RAMPS



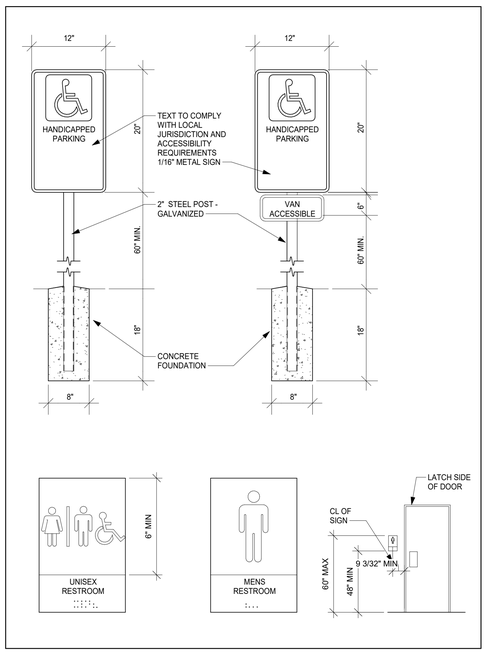
CURB RAMPS



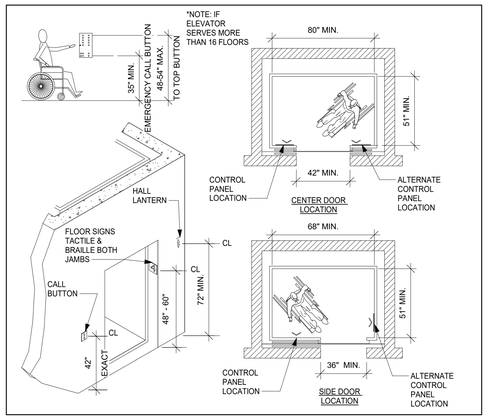
STAIRS



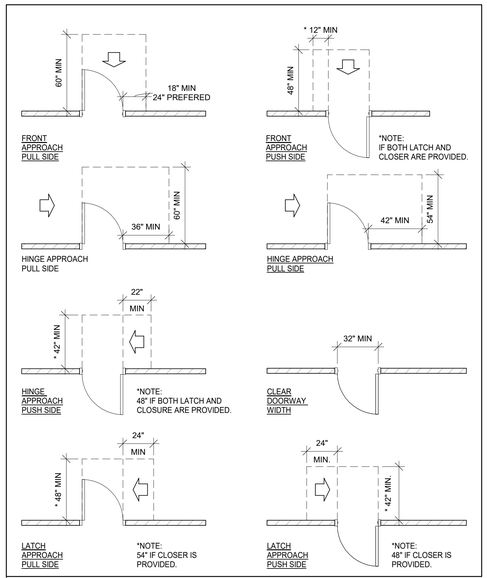
HANDICAP SIGN



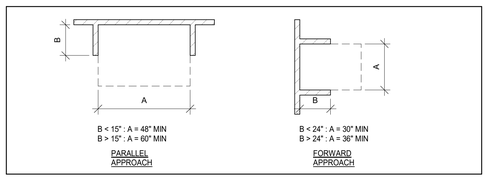
ELEVATORS



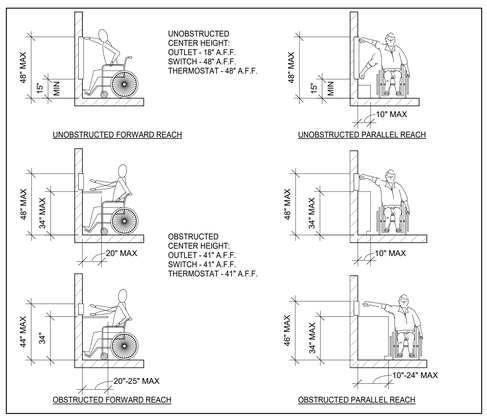
MANEUVERING CLEARANCE AT DOORS



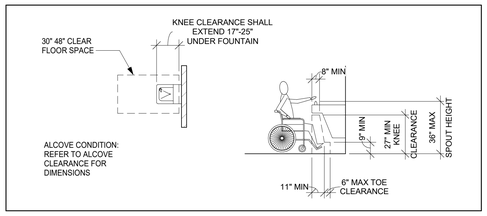
ALCOVE CLEARANCE



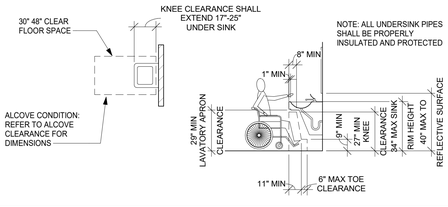
UNOBSTRUCTED-OBSTRUCTED REACH



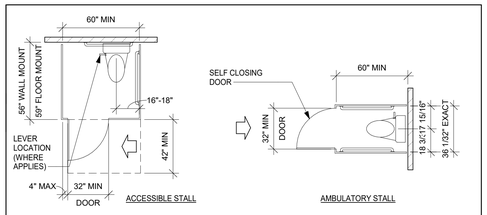
DRINKING FOUNTAIN CLEARANCE



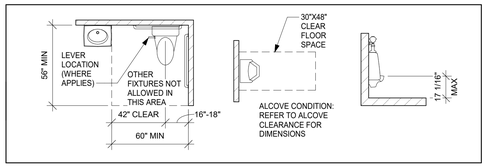
SINK CLEARANCE



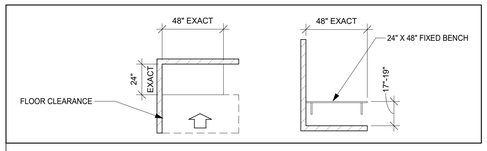
ACCESSIBLE AND AMBULATORY STALL



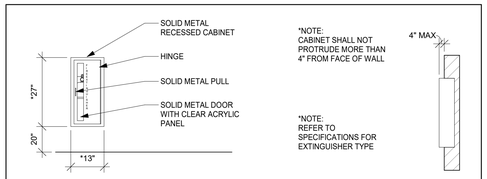
WATER CLOSET AND URINAL



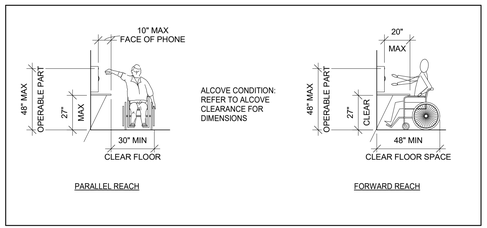
DRESSING ROOMS



FIRE EXTINGUISHER CABINET



TELEPHONES



GENERAL NOTES

1.	WHEN FIELD ISSUES ARISE, THE CONTRACTOR SHALL FIRST CONTACT FOR ASSISTANCE THE TECHNICAL SERVICE STAFF PROVIDED BY THE PRODUCT MANUFACTURER NOTED FOR THE DESIGN. USERS OF FIRE RESISTANCE ASSEMBLIES ARE ADVISED TO CONSULT THE GENERAL GUIDE INFORMATION FOR EACH PRODUCT CATEGORY AND EACH GROUP OF ASSEMBLIES. THE GUIDE INFORMATION INCLUDES SPECIFICS CONCERNING ALTERNATE MATERIALS AND ALTRERNATE METHODS OF CONSTRUCTION.
2.	ONLY PRODUCTS WHICH BEAR UL'S MARK ARE CONSIDERED AS CLASSIFIED. LISTED OR RECONGNIZED.
3.	ALL FINISHED CONSTRUCTION MUST MEET TEXAS ACCESSIBILITY STANDARDS AND ADA STANDARD
4.	THE TEXAS BOARD OF ARCHITECTURAL EXAMINERS HAS JURIDICTION OVER COMPLAINTS REGARDING THE PROFESSIONAL PRACTICES OF PERSONS REGISTERED AS ARCHITECTS IN TEXAS. CONTACT: TEXAS BOARD OF ARCHITECTURAL EXAMINERS; PO BOX 12337, AUSTIN TX 78711-2337; TELE: 512-305-9000; FAX: 512-305-8900

FOR REFERENCE

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
2012 TEXAS ACCESSIBILITY STANDARDS

DATE:
05/23/2019

JOB NO.:
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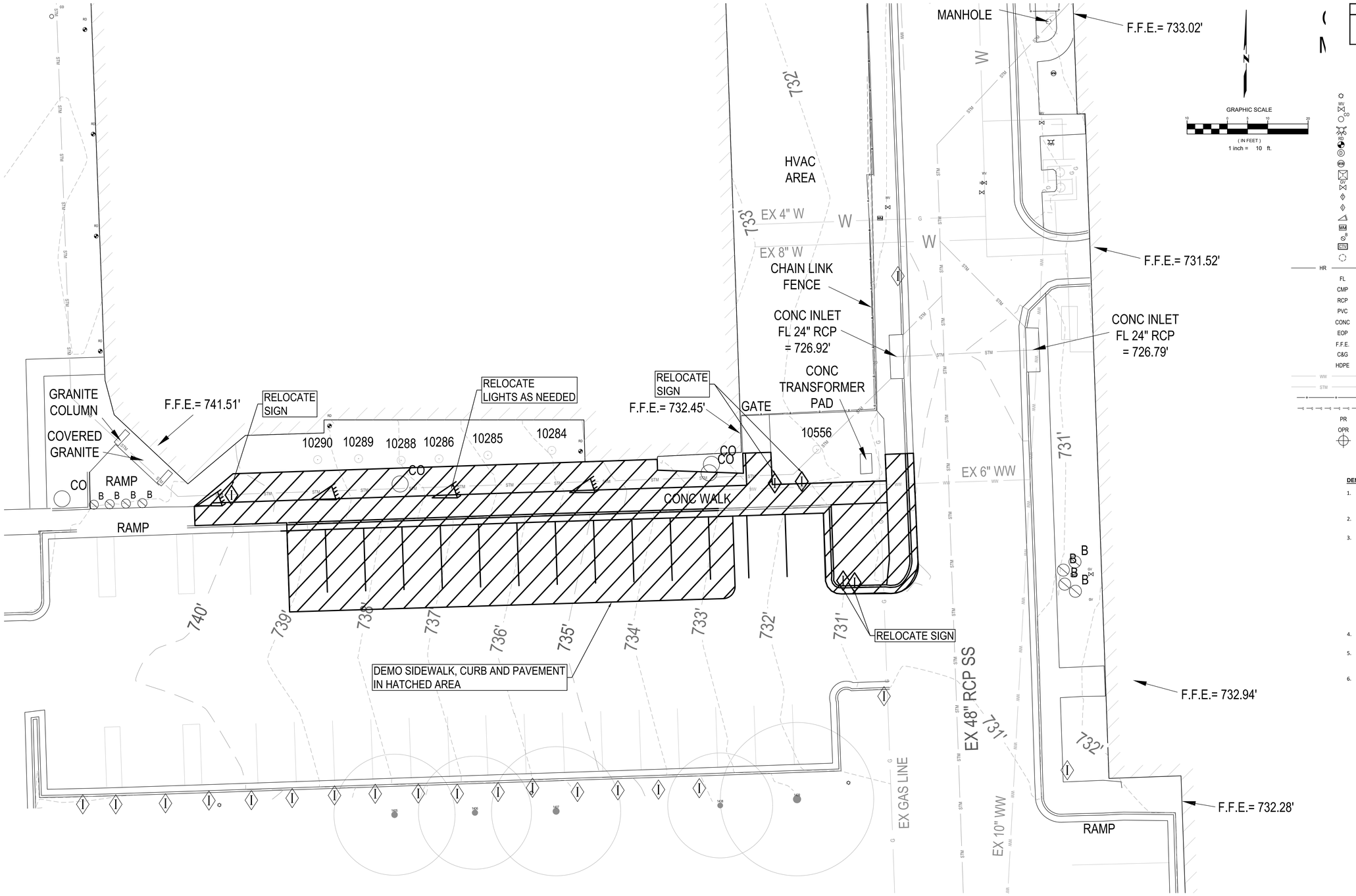
SHEET:
AG0.02



GRAPHIC SCALE

10 0 5 10 20

(IN FEET)

1 inch = 10 ft.

LEGEND	
100' / 100	EXISTING CONTOURS / EXISTING TREE (TO REMAIN)

LEGEND

	LIGHT POLE
WV	WATER VALVE
CO	SEWER CLEAN OUT
	FIRE HYDRANT
RD	ROOF DRAIN
D	STORMSEWER MANHOLE
WW	SANITARY SEWER MANHOLE
	ELECTRIC TRANSFORMER
GV	GAS VALVE
	TRAFFIC SIGN
	INFORMATION SIGN
	GROUND LIGHT
WM	WATER METER
B	BOLLARD
CTV	UNDERGROUND CABLE TV WARNING SIGN
	UNIDENTIFIED MANHOLE
HR	HAND RAIL
FL	FLOWLINE
CMP	CORRUGATED METAL PIPE
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE PIPE
CONC	CONCRETE
EOP	EDGE OF PAVEMENT
F.F.E.	FINISHED FLOOR ELEVATION
C&G	CONCRETE CURB AND GUTTER
HDPE	HIGH DENSITY POLYPROPYLENE
WW	UNDERGROUND WASTEWATER
STM	UNDERGROUND STORM SEWER
	CHAINLINK FENCE
	WROUGHT IRON FENCE
PR	PLAT RECORDS OF WILLIAMSON COUNTY, TEXAS
OPR	OFFICIAL PUBLIC RECORDS OF WILLIAMSON COUNTY, TEXAS
	BENCHMARK

DEMOLITION NOTES:

1. CONTRACTOR TO REPLACE ALL FEATURES DISTURBED DUE TO CONSTRUCTION AND/OR CONSTRUCTION ACCESS SUCH AS CONCRETE HEADWALLS, RIP-RAP, SIDEWALKS, TREES, PLANTINGS, CURB, DRIVEWAYS, ETC... WITH NEW, IN KIND MATERIALS.
2. ALL WORK IN PUBLIC EASEMENTS AND RIGHT-OF-WAYS SHALL BE PER APPLICABLE CITY, COUNTY, AND STATE STANDARD DETAILS AND SPECIFICATIONS.
3. UTILITY INFORMATION SHOWN HEREON CONSTITUTES A FIELD RECOVERY OF OBSERVED EVIDENCE OF UTILITIES AND IS SHOWN FOR THE CONVENIENCE OF THE CONTRACTOR BASED ON AVAILABLE INFORMATION. THIS INFORMATION IS NOT GUARANTEED TO BE CORRECT OR COMPLETE. LOCATIONS OF UNDERGROUND UTILITIES/STRUCTURES MAY VARY FROM LOCATIONS SHOWN HERE ON. ADDITIONAL BURIED UTILITIES/STRUCTURES, SUCH AS ELECTRICAL, TELEPHONE, CABLE, FIBER OPTICS, AND PIPE LINES, MIGHT BE ENCOUNTERED. NO EXCAVATIONS WERE MADE DURING THE PROGRESS OF THE SURVEY TO LOCATE BURIED UTILITIES/STRUCTURES. FOR INFORMATION REGARDING BURIED UTILITIES/STRUCTURES OR BEFORE ANY EXCAVATION IS BEGUN, PLEASE CONTACT THE APPROPRIATE AGENCIES FOR VERIFICATION OF UTILITY TYPE AND FOR FIELD LOCATION.
4. CONTRACTOR TO VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO DEMOLITION AND CONSTRUCTION AND ENSURE CONTINUITY OF SERVICES AS NECESSARY.
5. PROPOSED CONSTRUCTION AND DEMOLITION MAY REQUIRE HAND DIGGING FOR INSTALLATION OF NEW FEATURES AND UTILITIES, AND/OR PROTECTION AND SUPPORT/RELOCATION OF EXISTING FEATURES AND UTILITIES.
6. PROVIDE AND MAINTAIN A.D.A. ACCESSIBILITY TO FACILITIES THAT ARE TO REMAIN IN USE DURING CONSTRUCTION.

NOTE:
UNDERGROUND UTILITIES ARE SHOWN FOR REFERENCE ONLY AND ARE BASED ON PREVIOUS PLAN. CONTRACTOR TO VERIFY IN FIELD.

NOTE:
REF: ELECTRICAL SITE PLAN FOR POWER SERVICE INFORMATION.

!!! CAUTION !!!

EXISTING OVERHEAD UTILITIES IN VICINITY CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN WORKING NEAR ELECTRIC FACILITIES

!!! WARNING !!!

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF UNDERGROUND UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATION AND AVOIDING ALL EXISTING UTILITIES BY CALLING THE "ONE CALL" LOCATOR SERVICE AT (800) 344-8377 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

Drawing Path: E:\5591501_Drawings_Production Drawings\SHT_DEMO PLAN.dwg Plotted By: Russell Beamer Date: 5/23/2019 10:32:39 AM Layout: 30x42 Page Size: Previous paper size (42.00 x 30.00 Inches), 1:1

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STATE OF TEXAS
SEAN FRIEND
99671
LICENSED
PROFESSIONAL ENGINEER
May 23, 2019

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PROJECT:
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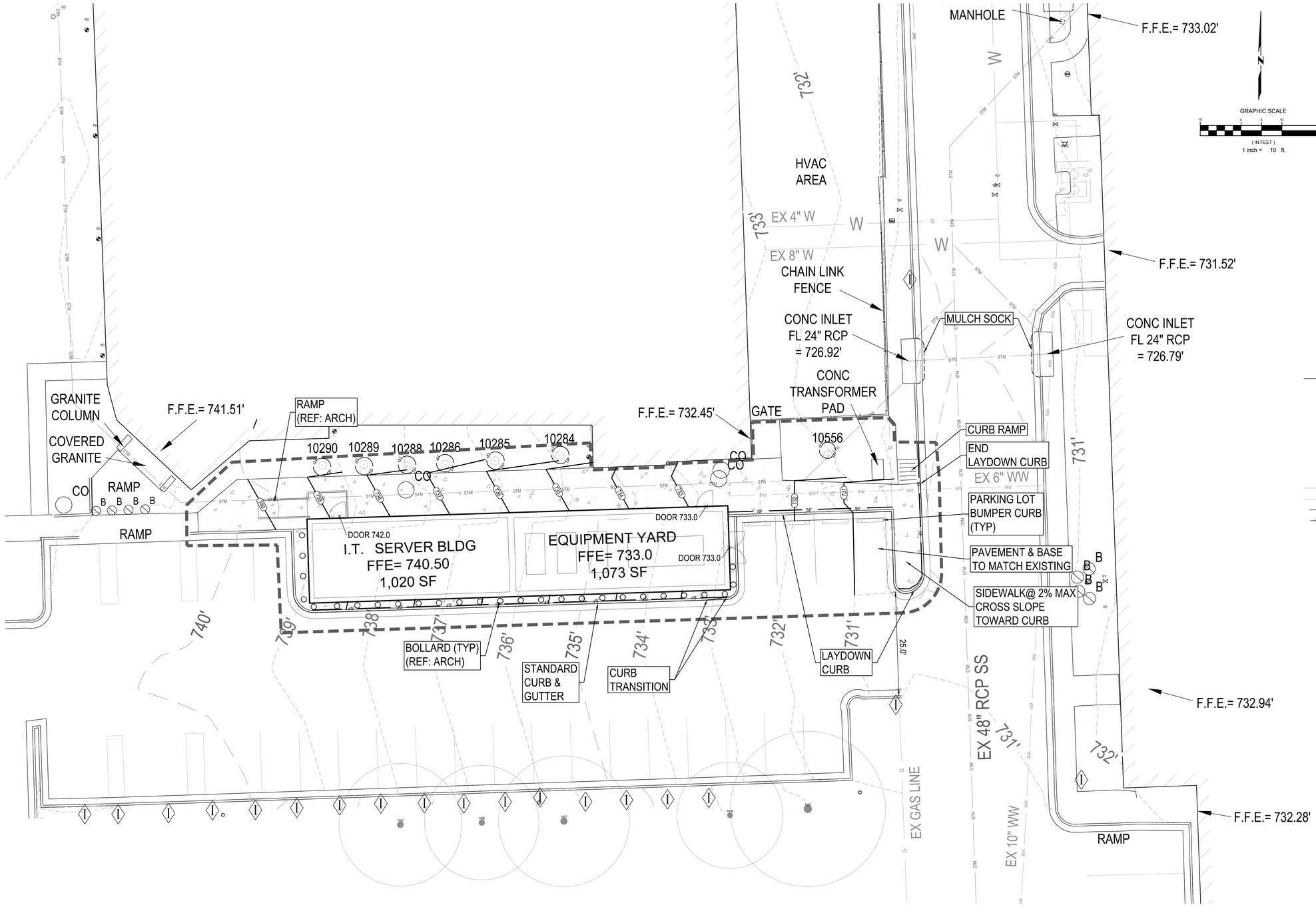
SHEET CONTENTS:
DEMOLITION PLAN

DATE:
MAY 23, 2019

JOB NO.:
5591501

SHEET:
C1.01



LEGEND

- EXISTING CONTOURS
- EXISTING TREE (TO REMAIN)
- PROPOSED CURB & GUTTER (UNLESS OTHERWISE NOTED PLANS)
- PROPOSED CONCRETE SIDEWALK (SEE PLAN FOR WIDTHS)
- L.O.C. (LIMITS OF CONSTRUCTION)
- SILT FENCE
- TREE PROTECTION
- PROPOSED ACCESSIBLE ROUTE
- PROPOSED CONTOURS
- PROPOSED SPOT GRADES

LEGEND

- LIGHT POLE
- WV — WATER VALVE
- CO — SEWER CLEAN OUT
- FIRE HYDRANT
- RD — ROOF DRAIN
- STORMSEWER MANHOLE
- SWM — SANITARY SEWER MANHOLE
- ELECTRIC TRANSFORMER
- GV — GAS VALVE
- TRAFFIC SIGN
- INFORMATION SIGN
- GROUND LIGHT
- WM — WATER METER
- BOLLARD
- CTV — UNDERGROUND CABLE TV WARNING SIGN
- UNIDENTIFIED MANHOLE
- HR — HAND RAIL
- FL — FLOWLINE
- CMP — CORRUGATED METAL PIPE
- RCP — REINFORCED CONCRETE PIPE
- PVC — POLYVINYL CHLORIDE PIPE
- CONC — CONCRETE
- EOP — EDGE OF PAVEMENT
- F.F.E. — FINISHED FLOOR ELEVATION
- C&G — CONCRETE CURB AND GUTTER
- HDPE — HIGH DENSITY POLYPROPYLENE
- WW — UNDERGROUND WASTEWATER
- STM — UNDERGROUND STORM SEWER
- CHAINLINK FENCE
- WROUGHT IRON FENCE
- PR — PLAT RECORDS OF WILLIAMSON COUNTY, TEXAS
- OPR — OFFICIAL PUBLIC RECORDS OF WILLIAMSON COUNTY, TEXAS
- BENCHMARK

SITE PLAN NOTES:

1. WHERE PROPOSED FEATURES TIE TO EXISTING FEATURES, CONTRACTOR TO VERIFY TOPOGRAPHY PRIOR TO CONSTRUCTION AND CONSTRUCT (WALLS, WALKS, DRIVES, UTILITIES, ETC...) TO MATCH EXISTING LOCATION AND ELEVATION IN ACCORDANCE WITH THE INTENT OF DESIGN. NOTIFY ENGINEER IF DISCREPANCY EXISTS BETWEEN EXISTING TOPOGRAPHY AND TOPOGRAPHY SHOWN ON PLANS.
2. ALL WORK IN PUBLIC EASEMENTS AND RIGHT-OF-WAYS SHALL BE PER APPLICABLE CITY, COUNTY, AND STATE STANDARD DETAILS AND SPECIFICATIONS.
3. CONTRACTOR TO VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO DEMOLITION AND CONSTRUCTION AND ENSURE CONTINUITY OF SERVICES AS NECESSARY.
4. PAVEMENT STRIPING SHALL BE WHITE PAINT, 4" WIDE.

GRADING NOTES:

1. ALL SIDEWALK AND CROSSWALK SLOPES SHALL NOT EXCEED THE FOLLOWING A.D.A. REQUIREMENTS:
   A. 1:20 LONGITUDINAL (ALONG THE WALK) MAX.
   B. 1:50 TRANSVERSE (ACROSS THE WALK) MAX.
2. ALONG AN ACCESSIBLE ROUTE, CHANGES IN LEVEL UP TO ¼" MAY BE VERTICAL AND WITHOUT EDGE TREATMENT, CHANGES IN LEVEL BETWEEN ¼" AND ½" SHALL BE BEVELED WITH A SLOPE NO GREATER THAN 1:2, AND CHANGES IN LEVEL GREATER THAN ½" SHALL BE ACCOMPLISHED BY MEANS OF AN ACCESSIBLE RAMP.

EROSION NOTES:

1. ADDITIONAL ENVIRONMENTAL CONTROLS MAY BE REQUIRED BY THE CITY AND OR COUNTY INSPECTOR AS CONSTRUCTION PROGRESSES.
2. CONCRETE "WASHOUT" LOCATIONS TO BE DETERMINED IN THE FIELD IN COORDINATION WITH CITY/COUNTY INSPECTOR. WASHOUT LOCATIONS ARE TO BE NOTED IN THE SWPPP, LOCATION SHOWN ON SITE PLAN IS FOR REFERENCE ONLY.
3. UNLESS OTHERWISE INDICATED ON THE LANDSCAPE PLANS AND SPECIFICATIONS:
   A. ALL DISTURBED AREAS AND AREAS DESIGNATED AS "GRASS AREAS" SHALL RECEIVE A MINIMUM OF 4" OF TOP SOIL AND BE REVEGETATED BY SEED, HYDROMULCH, OR SOD. MAINTAIN AND WATER THESE AREAS AS NECESSARY TO ESTABLISH PERMANENT VEGETATIVE GROWTH OF APPROXIMATELY TWO (2) INCHES OF HEIGHT OVER 70% OF AREA.
   B. TOPSOIL THAT HAS BEEN STRIPPED FROM THE SITE AND STOCKPILED MAY BE USED. REMOVE ALL BRUSH, TRASH, STUMPS, WOOD, CONCRETE AND OTHER DEBRIS OVER 1-1 ½ " IN SIZE PRIOR TO SPREADING.
   C. IF SUFFICIENT QUANTITIES ARE NOT AVAILABLE, PROVIDE IMPORTED TOPSOIL CHARACTERISTIC OF THE AREA. PROVIDE IMPORTED LOAM TOPSOIL CONTAINING A MINIMUM ORGANIC MATTER CONTENT BY WEIGHT OF 5%. TOPSOIL SHALL NOT HAVE A MIXTURE OF SUBSOIL AND SHALL CONTAIN NO STONES, LUMPS OF SOIL, STICKS, ROOTS, TRASH OR OTHER EXTRANEOUS MATERIALS LARGER THAN 1 ½ INCHES IN DIAMETER OR LENGTH.
   D. APPLY TOPSOIL TO ENSURE A MINIMUM OF 4" DEPTH IN ALL DISTURBED AREAS. TILL SOIL TO A DEPTH OF 2 INCHES. RAKE SOIL SMOOTH, FREE FORM VARIATIONS, BUMPS AND DEPRESSIONS TO FINISH GRADE. ALL AREAS SHALL SLOPE TO DRAIN.

TREE LIST	
TAG #	Description
1401	14" LIVE OAK
1402	16" LIVE OAK
1403	13" LIVE OAK
1404	14" LIVE OAK
1405	15" LIVE OAK
1406	14" LIVE OAK
1407	16" LIVE OAK
1408	13" LIVE OAK
1409	19" LIVE OAK

TREE LIST	
1410	12" LIVE OAK
10284	" LANDSCAPE TREE
10285	" LANDSCAPE TREE
10286	" LANDSCAPE TREE
10288	" LANDSCAPE TREE
10289	" LANDSCAPE TREE
10290	" LANDSCAPE TREE
10556	" LANDSCAPE TREE
10635	" LANDSCAPE TREE
10824	" LANDSCAPE TREE

PARKING

EXISTING = 1,253 (SEE ORIGINAL SITE PLAN)

REMOVED (NET) = 10

TOTAL = 1,243

NOTE:
UNDERGROUND UTILITIES ARE SHOWN FOR REFERENCE ONLY AND ARE BASED ON PREVIOUS PLAN. CONTRACTOR TO VERIFY IN FIELD.

NOTE:
REF: ELECTRICAL SITE PLAN FOR POWER SERVICE INFORMATION.

!!! CAUTION !!!

EXISTING OVERHEAD UTILITIES IN VICINITY CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN WORKING NEAR ELECTRIC FACILITIES

!!! WARNING !!!

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF UNDERGROUND UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATION AND AVOIDING ALL EXISTING UTILITIES BY CALLING THE 'ONE CALL" LOCATOR SERVICE AT (800) 344-8377 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

Drawing Path: E:\5591501_Drawings_Production Drawings\SHT_SITE, GRADING & EROSION CONTROL PLAN.dwg Plotted By: Russell Beamer Date: 5/23/2019 10:32:49 AM Layout: SITE - GRADING AND EROSION CONTROL PLAN Page Size: Previous paper size (42.00 x 30.00 Inches), 1:1

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STATE OF TEXAS
SEAN FRIEND
99671
LICENSED PROFESSIONAL ENGINEER
May 23, 2019

REVISIONS:

WILLIAMSON COUNTY - JUSTICE CENTER - I.T. SERVER BUILDING

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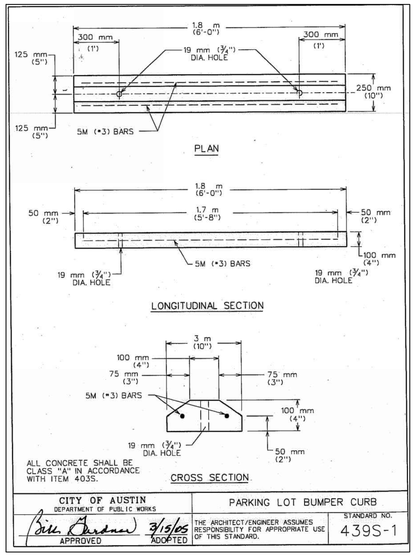
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
SITE, GRADING AND EROSION CONTROL PLAN

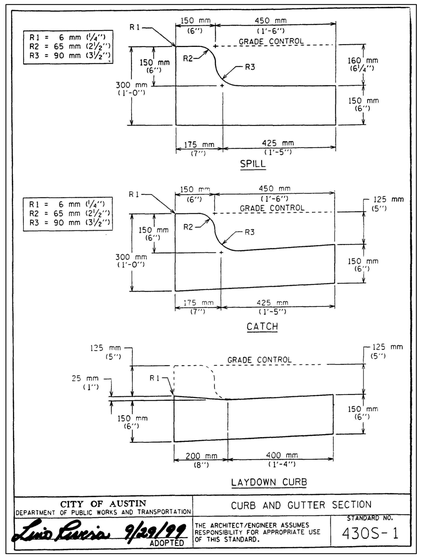
DATE:
MAY 23, 2019

JOB NO.
5591501

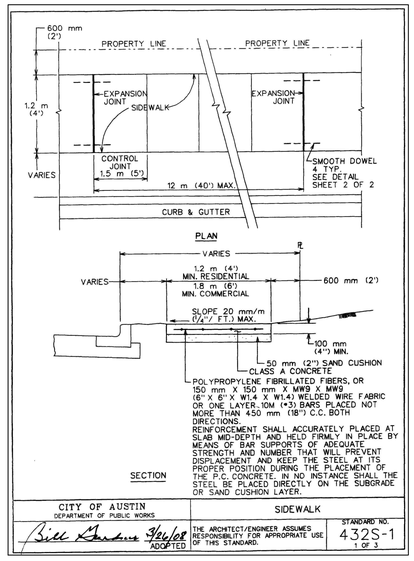
SHEET:
C2.01



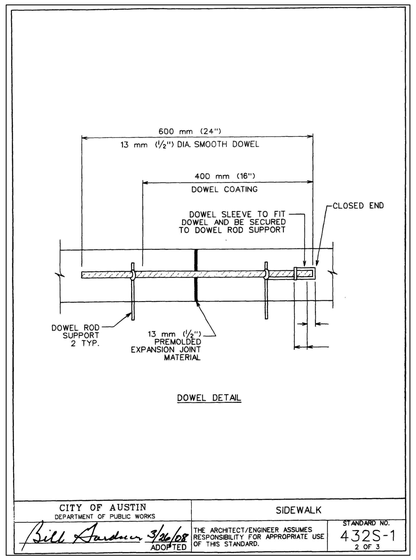
CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	PARKING LOT BUMPER CURB	
Bill Gardner 3/15/05 APPROVED ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 439S-1



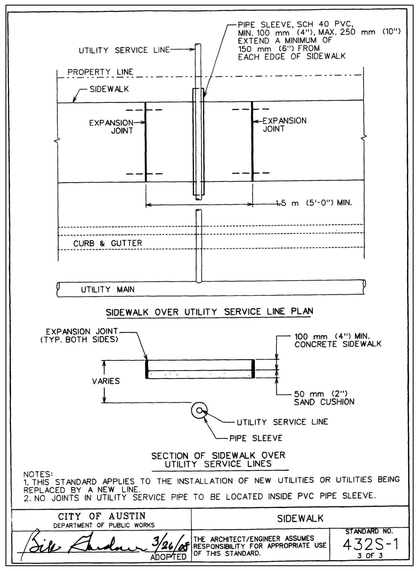
CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION	CURB AND GUTTER SECTION	
Lisa Lavoie 9/29/99 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 430S-1



CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	SIDEWALK	
Bill Gardner 3/26/08 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 432S-1 1 OF 3



CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	SIDEWALK	
Bill Gardner 3/26/08 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 432S-1 2 OF 3



NOTES:
1. THIS STANDARD APPLIES TO THE INSTALLATION OF NEW UTILITIES OR UTILITIES BEING REPLACED BY A NEW LINE.
2. NO JOINTS IN UTILITY SERVICE PIPE TO BE LOCATED INSIDE PVC PIPE SLEEVE.

CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	SIDEWALK	
Bill Gardner 3/26/08 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 432S-1 3 OF 3

CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	DETECTABLE WARNING-PAVER (CITY PROPERTY/EASEMENTS)	
Bill Gardner 6/21/07 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 432S-2A 1 OF 2

GENERAL NOTES:
1. THIS STANDARD IS APPLICABLE FOR RAMP CONSTRUCTION ON CITY PROPERTY AND EASEMENT AREAS ONLY.
2. PAVERS ARE REQUIRED FOR ALL CURB RAMP INSTALLATIONS.
3. PAVERS WILL HAVE DETECTABLE WARNING THAT CONSISTS OF RAISED TRUNCATED DOMES WITH A DIAMETER OF 0.9" (23 mm"), A NOMINAL HEIGHT OF 0.2" (5 mm) AND A NOMINAL CENTER TO CENTER SPACING OF 2.35" (60 mm) AND SHALL CONSTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT (Re: ADAAG SECTION 4.29.2). MATERIAL USED TO PROVIDE CONTRAST SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE. PAVER PATTERN SHALL BE BASKET WEAVE UNLESS DIRECTED OTHERWISE BY THE ENGINEER OR DESIGNATED REPRESENTATIVE.
4. TYPICAL SIDEWALK WIDTHS AND CURB RADII ARE SHOWN FOR ILLUSTRATION ONLY. REFER TO THE TRANSPORTATION CRITERIA MANUAL FOR SIDEWALK WIDTHS, CURB RADII AND CURB BASIS.
5. THE PERMISSIBLE CONSTRUCTION JOINT BETWEEN THE PAVERS AND THE ADJOINING SURFACE SHALL BE LIMITED TO ¼" (6 mm) JOINT SIZE. GAPS LARGER THAN ¼" (6 mm) MUST BE APPROVED BY THE ENGINEER OR DESIGNATED REPRESENTATIVE. ALL JOINTS BETWEEN BRICKS AND ADJOINING SURFACE SHALL BE MORTAR FILLED UNLESS DIRECTED OTHERWISE BY THE ENGINEER OR DESIGNATED REPRESENTATIVE.
6. MORTAR SHALL CONFORM TO STD. SPECIFICATION ITEM SECTION 403S.3.5. MORTAR AND GROUT. ALL OTHER CONCRETE SHALL CONFORM TO STD. SPECIFICATION ITEM 403S. CONCRETE FOR STRUCTURES, UNLESS OTHERWISE NOTED.
7. CURB RAMPS WITH RETURNED CURB MAY ONLY BE USED WHERE PEDESTRIANS WOULD NOT NORMALLY WALK DIAGONALLY ACROSS THE RAMP.

CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	DETECTABLE WARNING-PAVER (CITY PROPERTY/EASMENTS)	
Bill Gardner 6/21/07 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 432S-2A 2 OF 2

CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	TREE PROTECTION FENCE LOCATIONS	
ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 610S-1

1. STEEL OR WOOD POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF 300 mm (12 INCHES). IF WOOD POSTS CANNOT ACHIEVE 300 mm (12 Inches) DEPTH, USE STEEL POSTS.
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.
3. THE TRENCH MUST BE A MINIMUM OF 150 mm (6 Inches) DEEP AND 150 mm (6 Inches) WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.
4. SILT FENCE FABRIC SHOULD BE SECURELY FASTENED TO EACH STEEL OR WOOD SUPPORT POST OR TO WOVEN WIRE , WHICH IS IN TURN ATTACHED TO THE STEEL OR WOOD FENCE POST.
5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL EVENT AND 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 150 mm (6 Inches). THE SILT SHALL BE DISPOSED OF ON AN APPROVED SITE AND IN SUCH A MANNER THAT WILL NOT CONTRIBUTE TO ADDITIONAL SILTATION.

CITY OF AUSTIN WATERSHED PROTECTION DEPARTMENT	SILT FENCE	
9/1/2011 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 642S-1

USE UNTREATED WOOD CHIPS PRODUCED FROM A 3 (THREE) INCH MINUS SCREENING PROCESS (EQUIVALENT TO TXDOT ITEM 161, COMPOST, SECTION 1.9.2.B, WOOD CHIP REQUIREMENTS).

MULCH CONSISTS PRIMARILY OF ORGANIC MATERIAL, SEPARATED AT THE POINT OF GENERATION, AND MAY INCLUDE: SHREDDED BARK, STUMP GRINDINGS, OR COMPOSTED BARK.

LARGE PORTIONS OF SILT, CLAYS, OR FINE SANDS ARE NOT ACCEPTABLE IN THE MULCH.

NOTES:
1. STEEL OR WOOD POSTS WHICH SUPPORT THE MULCH SOCK SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF 600mm (24 Inches). IF WOOD POSTS CANNOT ACHIEVE 600mm (24 Inches) DEPTH, USE STEEL POSTS. EARTH ANCHORS ARE ALSO ACCEPTABLE.
2. THE TOE OF THE MULCH SOCK SHALL BE PLACED SO THAT THE MULCH SOCK IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. IN ORDER TO PREVENT WATER FROM FLOWING BETWEEN THE JOINTS OF ADJACENT ENDS OFMULCH SOCKS, LAP THE ENDS OF ADJACENT MULCH SOCKS A MINIMUM OF 300mm (12 Inches).
3. MULCH MATERIAL MUST BE FREE OF REFUSE, PHYSICAL CONTAMINANTS, AND MATERIAL TOXIC TO PLANT GROWTH; IT IS NOT ACCEPTABLE FOR THE MULCH MATERIAL TO CONTAIN GROUND CONSTRUCTION DEBRIS, BIOSOLIDS, OR MANURE.
4. SOCK MATERIAL WILL BE 100% BIODEGRADABLE, PHOTODEGRADABLE, OR RECYCLABLE SUCH AS BURLAP, TWINE, UV PHOTOBIODEGRADABLE PLASTIC, POLYESTER, OR ANY OTHER ACCEPTABLE MATERIAL.
5. MULCH SOCKS SHOULD BE USED AT THE BASE OF SLOPES NO STEEPER THAN 2:1 AND SHOULD NOT EXCEED THE MAXIMUM SPACING CRITERIA PROVIDED IN CITY OF AUSTIN ENVIRONMENTAL CRITERIA MANUAL TABLE 1.4.5.F.1 FOR A GIVEN SLOPE CATEGORY.
6. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 150mm (6 Inches). THE SILT SHALL BE DISPOSED OF ON AN APPROVED SITE AND IN SUCH A MANNER THAT WILL NOT CONTRIBUTE TO ADDITIONAL SILTATION.

CITY OF AUSTIN WATERSHED PROTECTION DEPARTMENT	MULCH SOCK	
08/24/2010 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 648S-1

!!! CAUTION !!!

EXISTING OVERHEAD UTILITIES IN VICINITY CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN WORKING NEAR ELECTRIC FACILITIES

!!! WARNING !!!

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF UNDERGROUND UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATION AND AVOIDING ALL EXISTING UTILITIES BY CALLING THE "ONE CALL" LOCATOR SERVICE AT (800) 344-8377 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

Drawing Path: E:\5591501_Drawings_Production Drawings\SHT_SITE, GRADING & EROSION CONTROL PLAN.dwg Plotted By: Russell Beamer Date: 5/23/2019 10:32:53 AM Layout: CONSTRUCTION DETAILS Page Size: Previous paper size (42.00 x 30.00 Inches), 1:1

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STATE OF TEXAS SEAN FRIEND 99671 LICENSED PROFESSIONAL ENGINEER
May 23, 2019

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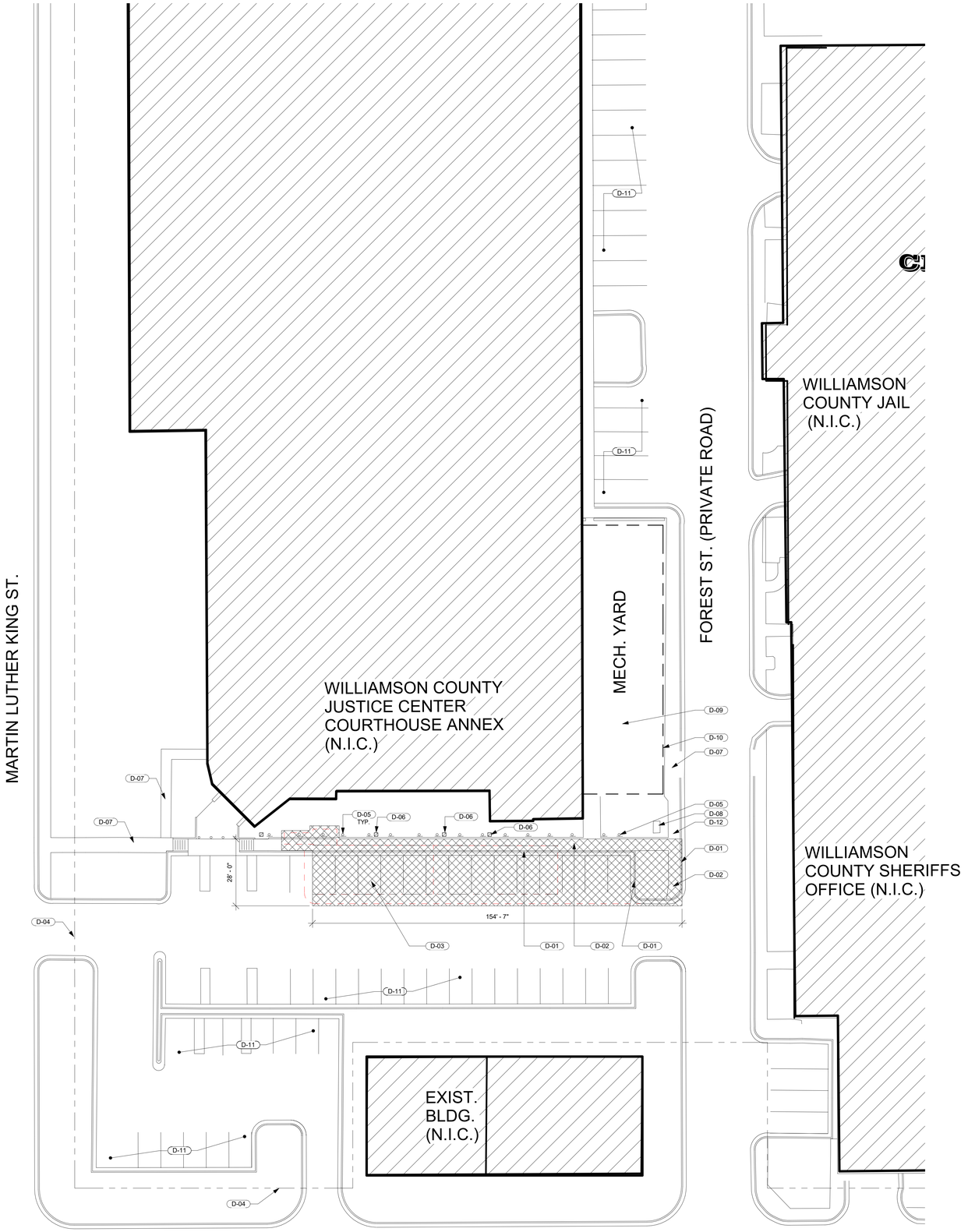
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
CONSTRUCTION DETAILS

DATE:
MAY 23, 2019

JOB NO.:
5591501

SHEET:
C3.01



ARCHITECTURAL SITE PLAN DEMO

SCALE: 1" = 20'-0"

1

SITE DEMOLITION NOTES

SD#	DESCRIPTION
D-01	EXISTING CURB TO BE REMOVED.
D-02	EXISTING SIDEWALK TO BE REMOVED AND REBUILT ACCORDING TO CIVIL PLANS.
D-03	SAWCUT AND REMOVE EXISTING ASPHALT PAVED PARKING AREA, REFER TO CIVIL PLANS.
D-04	PROPERTY LINE
D-05	RELOCATE SIGN AND/OR POLE AS NEEDED, FROM IN FRONT OF EACH PARKING SPACE, TYP.
D-06	RELOCATE EXTERIOR LIGHTS AS NEEDED
D-07	EXISTING SIDEWALK TO REMAIN, PROTECT DURING DEMO AND CONSTRUCTION
D-08	EXISTING ELECTRICAL TRANSFORMER TO REMAIN, PROTECT DURING CONSTRUCTION
D-09	EXISTING UTILITY YARD TO REMAIN
D-10	EXISTING CHAIN LINK FENCE TO REMAIN
D-11	EXISTING PARKING SPACES AND DRIVE TO REMAIN
D-12	EXISTING CURB RAMP TO REMAIN

GENERAL SITE NOTES

1.	DO NOT SCALE DRAWINGS
2.	NOTIFY THE ARCHITECT OR/ AND THE OWNER OF ANY DISCREPANCIES AND/ OR OMISSIONS, PRIOR TO THE START OF WORK. WITHOUT NOTIFICATION, THE CONTRACTOR ASSUMES RESPONSIBILITY FOR ALL EXISTING CONDITIONS
3.	THE ARCHITECTURAL SITE PLAN IS FOR REFERNCE ONLY. REFER TO CIVIL DRAWINGS FOR GRADING, TOPO, AND DRAINAGE INFORMATION

REGISTERED ARCHITECT STATE OF TEXAS

05/23/2019

REVISIONS:

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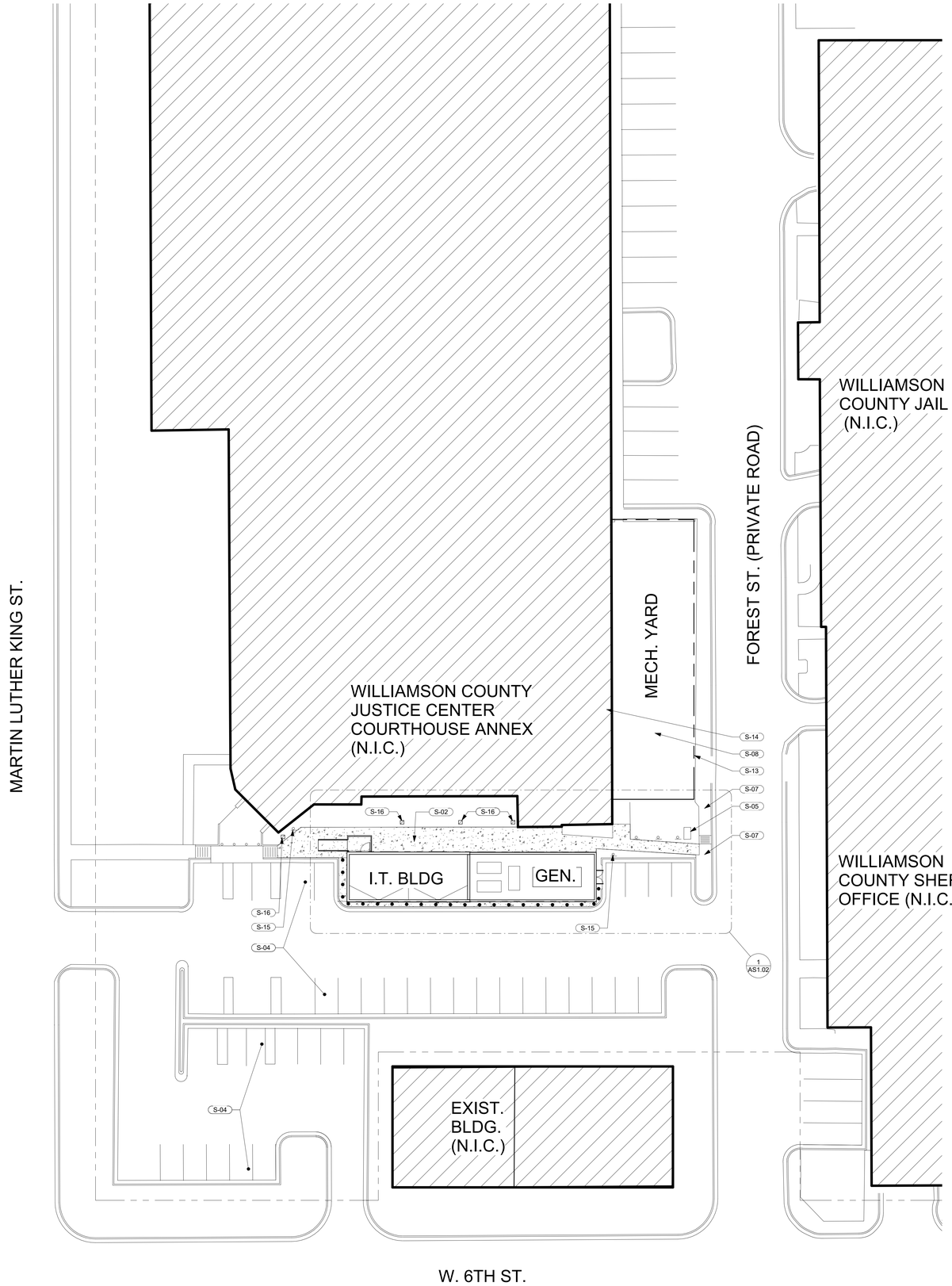
SHEET CONTENTS:
ARCHITECTURAL SITE PLAN - DEMO

DATE:
05/23/2019

JOB NO.
18465.01

SHEET:
ASD 1.01



ARCHITECTURAL SITE PLAN

SCALE: 1" = 20'-0"

1

SITE PLAN NOTES

S#	DESCRIPTION
S-01	GENERATOR ON CONCRETE PAD. REFER TO ELECTRICAL AND STRUCTURAL DRAWINGS, VERIFY PAD SIZE W/ GENERATORS' SIZE.
S-02	NEW CONCRETE SIDEWALK REFER TO CIVIL DRAWINGS.
S-04	EXISTING PARKING SPACES
S-05	EXISTING ELECTRICAL TRANSFORMER, PROTECT FROM DAMAGE
S-06	BOLLARDS PLACED EVENLY SPACED, REF. 4/AS2.01
S-07	EXISTING SIDEWALK TO REMAIN
S-08	EXISTING UTILITY YARD.
S-09	CONCRETE RAMP, REF. 3/A2.01
S-11	LAYDOWN CURB, REFER TO CIVIL
S-12	CURB, REFER TO CIVIL DRAWINGS
S-13	EXISTING CHAIN LINK FENCE
S-14	EXISTING COUNTY JUSTICE CENTER BUILDING
S-15	RELOCATED SIGN
S-16	RELOCATED LIGHTS, REFER TO CIVIL
S-17	CONDENSING UNITS ON CONCRETE PADS. REFER TO ELECTRICAL & STRUCTURAL DRAWINGS. VERIFY PAD SIZE W/ EQUIPMENT SIZE.

GENERAL SITE NOTES

1.	DO NOT SCALE DRAWINGS
2.	NOTIFY THE ARCHITECT OR/ AND THE OWNER OF ANY DISCREPANCIES AND/ OR OMISSIONS, PRIOR TO THE START OF WORK. WITHOUT NOTIFICATION, THE CONTRACTOR ASSUMES RESPONSIBILITY FOR ALL EXISTING CONDITIONS
3.	THE ARCHITECTURAL SITE PLAN IS FOR REFERNCE ONLY. REFER TO CIVIL DRAWINGS FOR GRADING, TOPO, AND DRAINAGE INFORMATION

REGISTERED ARCHITECT STATE OF TEXAS

05/23/2019

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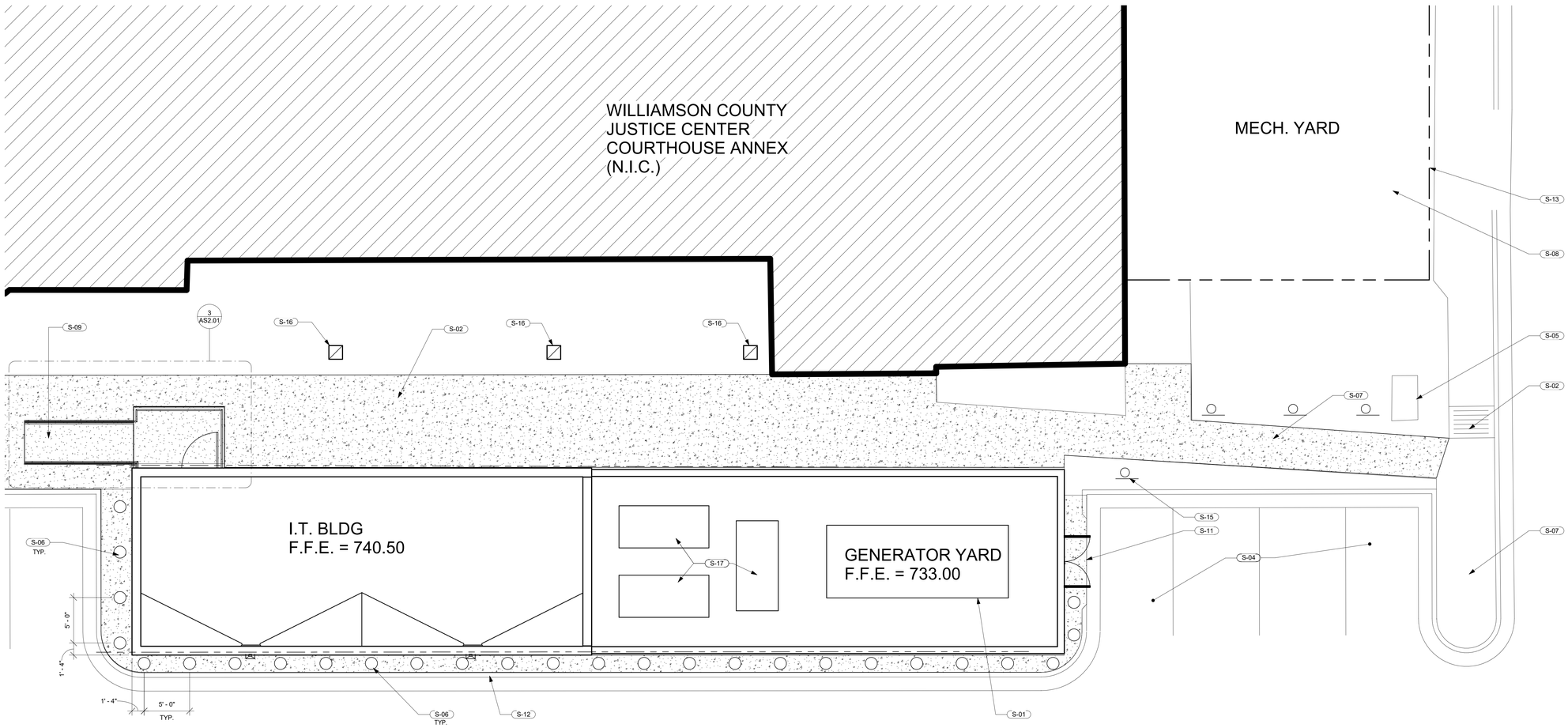
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
OVERALL ARCHITECTURAL SITE PLAN

DATE:
05/23/2019

JOB NO.
18465.01

SHEET:
AS1.01



ARCHITECTURAL SITE PLAN

SCALE: 3/16" = 1'-0"

1

SITE PLAN NOTES

S#	DESCRIPTION
S-01	GENERATOR ON CONCRETE PAD. REFER TO ELECTRICAL AND STRUCTURAL DRAWINGS, VERIFY PAD SIZE W/ GENERATORS' SIZE.
S-02	NEW CONCRETE SIDEWALK REFER TO CIVIL DRAWINGS.
S-04	EXISTING PARKING SPACES
S-05	EXISTING ELECTRICAL TRANSFORMER, PROTECT FROM DAMAGE
S-06	BOLLARDS PLACED EVENLY SPACED, REF. 4/AS2.01
S-07	EXISTING SIDEWALK TO REMAIN
S-08	EXISTING UTILITY YARD.
S-09	CONCRETE RAMP, REF. 3/A2.01
S-11	LAYDOWN CURB, REFER TO CIVIL
S-12	CURB, REFER TO CIVIL DRAWINGS
S-13	EXISTING CHAIN LINK FENCE
S-14	EXISTING COUNTY JUSTICE CENTER BUILDING
S-15	RELOCATED SIGN
S-16	RELOCATED LIGHTS, REFER TO CIVIL
S-17	CONDENSING UNITS ON CONCRETE PADS. REFER TO ELECTRICAL & STRUCTURAL DRAWINGS. VERIFY PAD SIZE W/ EQUIPMENT SIZE.

GENERAL NOTES

1. THIS DRAWING IS FOR REFERENCE ONLY
2. REFER TO CIVIL DRAWINGS FOR ALL SITE INFORMATION AND DIMENSIONS

REGISTERED ARCHITECT
STATE OF TEXAS

05/23/2019

REVISIONS:

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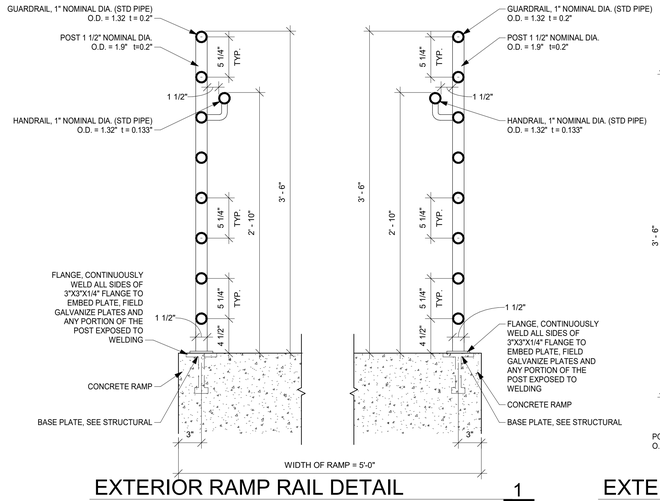
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
ENLARGED SITE PLAN

DATE:
05/23/2019

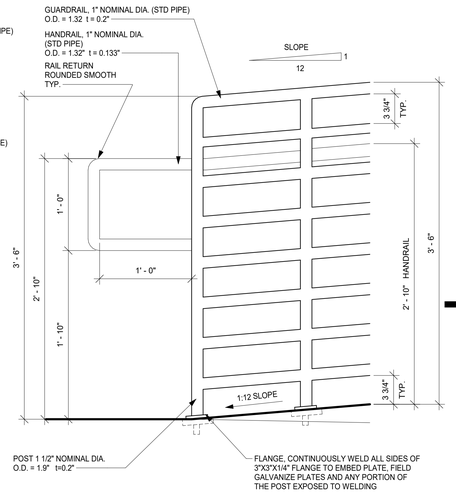
JOB NO.:
18465.01

SHEET:
AS1.02



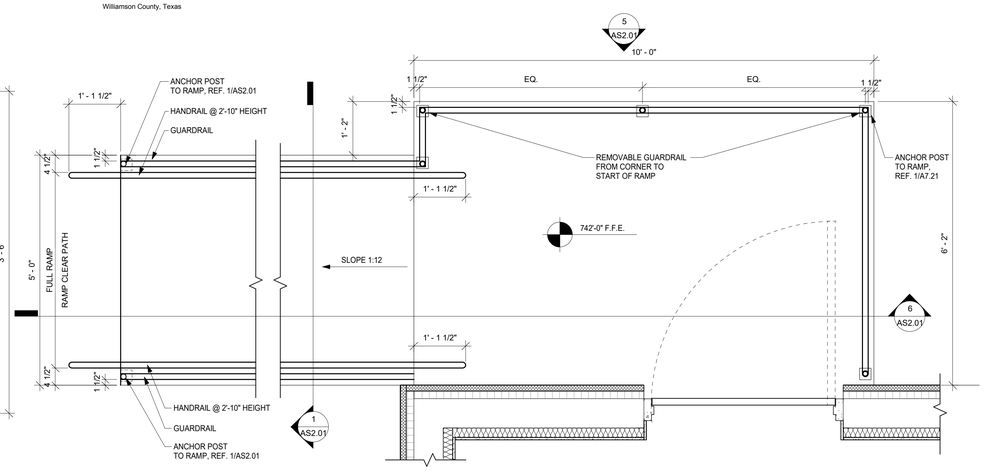
EXTERIOR RAMP RAIL DETAIL 1

SCALE: 1 1/2" = 1'-0"



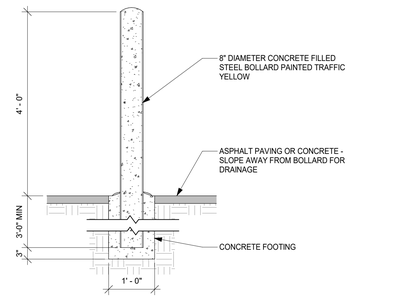
EXTERIOR RAMP RAIL DETAIL 2

SCALE: 1 1/2" = 1'-0"



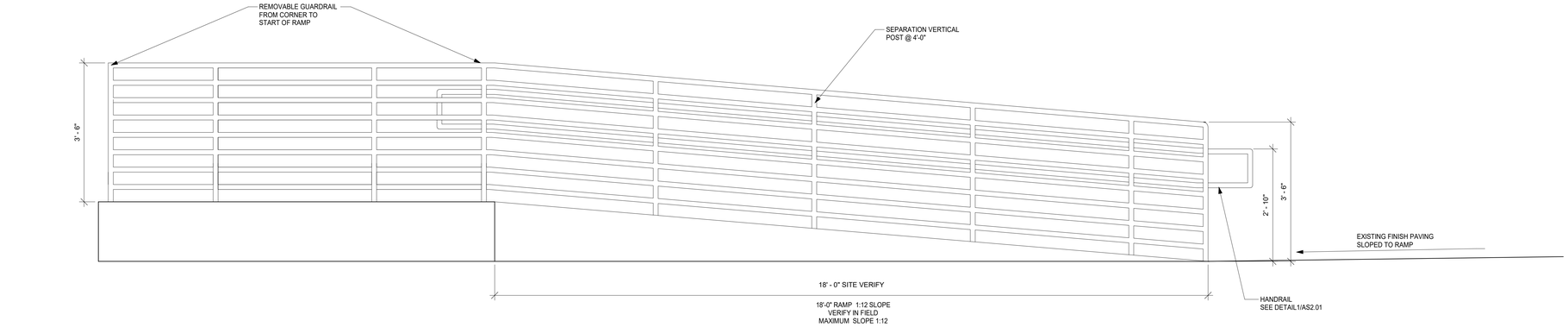
EXTERIOR RAMP RAIL DETAIL 3

SCALE: 3/4" = 1'-0"



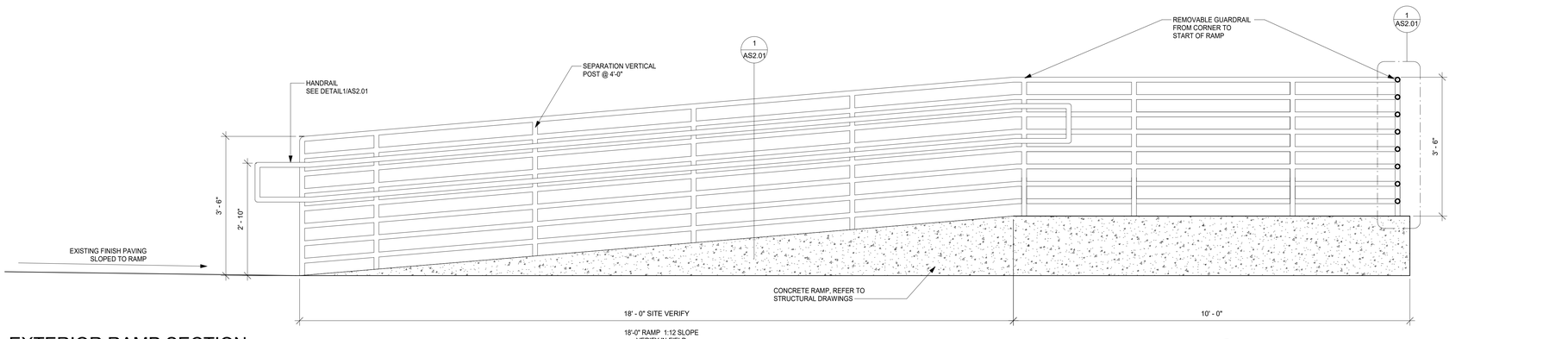
CONCRETE BOLLARD DETAIL 4

SCALE: 3/4" = 1'-0"



EXTERIOR RAMP ELEVATION 5

SCALE: 3/4" = 1'-0"



EXTERIOR RAMP SECTION 6

SCALE: 3/4" = 1'-0"

RAMP NOTES

1	PAINT ANY PORTION OF THE RAILING OR BASE PLATE THAT CONTACTS THE CONCRETE WITH EXTERIOR EPOXY PAINT PRIOR TO INSTALLATION.
2	ALL HANDRAILS MUST HAVE A CONTINIOUS SMOOTH SURFACE.
3	ALWAYS MAINTAIN MIN. OF 1 1/2" CLEAR SEPARATION BETWEEN HANDRAIL AND ANY WALL.
4	SWITCH BACK AND RAIL RETURNS SHOULD ALWAYS BE CONTINUOUS.
5	THE 12 INCH HANDRAIL EXTENSION SHALL BE CLEAR DIMENSION SPACE.
6	TOP OF HANDRAIL GRIPPING SURFACE SHALL BE MOUNTED AT 34" AND NO MORE THAN 38" ABOVE RAMP SURFACES.
7	ENDS OF HANDRAILS SHALL BE PROVIDED AND RETURNED SMOOTHLY TO THE FIRST POST.
8	SUBCONTRACTOR TO PROVIDE SHOP DRAWINGS FOR ANY ATTACHMENTS AND ANY ITEMS REQUIRED SHOP FABRICATION PRIOR TO INSTALLATION.
9	POSTS, HANDRAILS, AND GUARDRAILS TO BE PAINTED COLOR SW 6386, PAINT SHOULD BE AN ACRYLIC/POLYESTER URETHANE EXTERIOR PAINT

REGISTERED ARCHITECT
STATE OF TEXAS
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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
SITE DETAILS

DATE:
05/23/2019

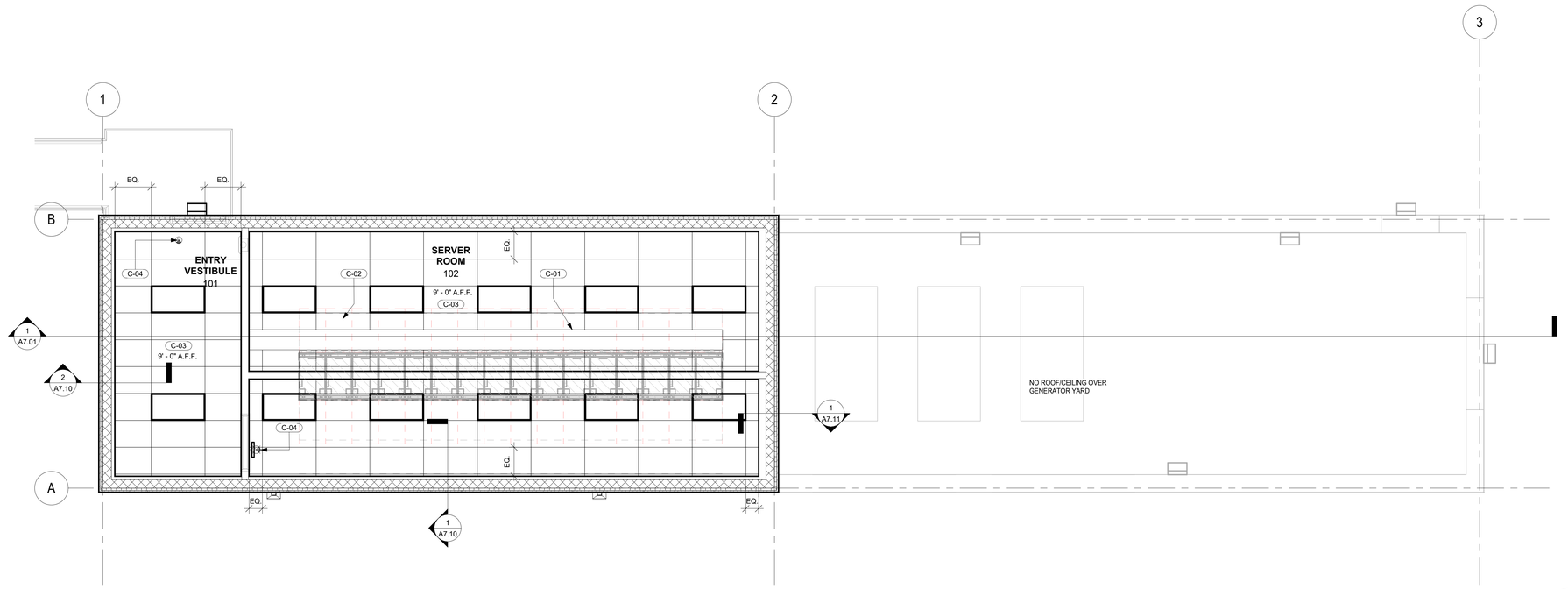
JOB NO.:
18465.01

SHEET:
AS2.01

ALTERNATES

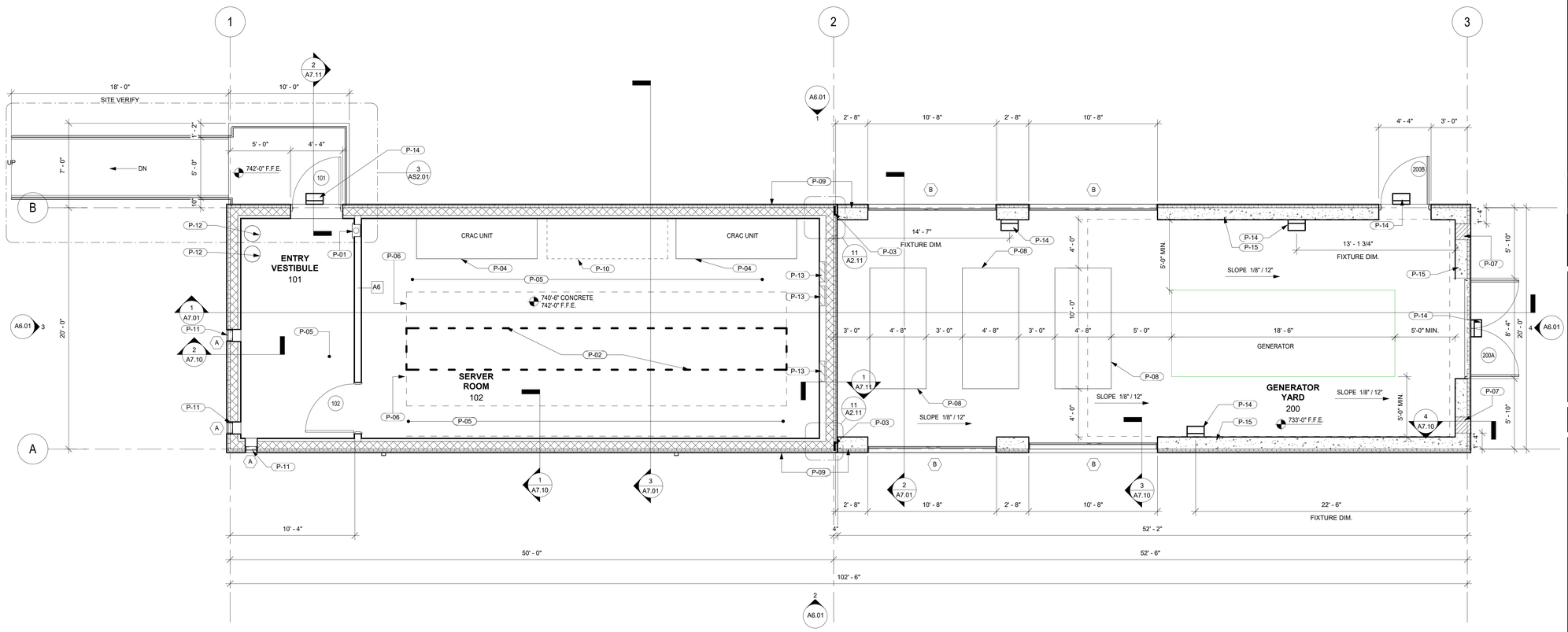
ALTERNATE 1:

ALTERNATE 1 INCLUDES THE REPLACEMENT OF STANDARD STRUCTURAL SYSTEMS WITH HARDENED STRUCTURAL SYSTEMS TO ACHIEVE AN EF3 STORM RATING AS INDICATED ON STRUCTURAL DRAWINGS. HARDENED STRUCTURAL SYSTEMS INCLUDE EXTERIOR WALLS, YARD WALLS, AND ROOF ASSEMBLIES. THIS ALTERNATE ALSO INCLUDES THE ADDITION OF A REMOVABLE GRATE OVER THE MECHANICAL YARD. AS PART OF THIS ALTERNATE, STANDARD EXTERIOR DOORS AND LOUVERS ARE ALSO TO BE REPLACED WITH STORM RATED DOORS AND LOUVERS AS INDICATED ON SCHEDULES AND IN SPECIFICATIONS.



REFLECTED CEILING PLAN

SCALE: 1/4" = 1'-0"



FIRST FLOOR PLAN

SCALE: 1/4" = 1'-0"

PLAN KEYNOTES

P#	DESCRIPTION
P-01	RECESSED FIRE EXTINGUISHER. REFER TO DETAIL 2/A9.01
P-02	SERVER RACK
P-03	2" EXPANSION JOINT. REFER TO DETAIL 10/A2.11
P-04	CRAC UNIT. REFER TO MEP DRAWINGS
P-05	18" RAISED FLOOR SYSTEM, REFER TO SPECS
P-06	CLEARANCE SPACE FOR SERVER RACKS
P-07	8" x 16" OPENING AT BASE OF WALL FOR WATER DRAINAGE
P-08	MECHANICAL UNITS, REFER TO MECHANICAL DRAWINGS
P-09	ALIGN WALLS
P-10	FUTURE CRAC UNIT
P-11	VENTILATION LOUVER BELOW CEILING, REFER TO MECHANICAL DRAWINGS, COORDINATE IN FIELD.
P-12	NEW CLEAN-AGENT FIRE EXTINGUISHING SYSTEM, REFER TO FIRE PROTECTION DRAWINGS
P-13	ELECTRICAL PANELS, REFER TO ELECTRICAL DRAWINGS
P-14	WALL MOUNTED LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS, WHERE OVER DOORS, CENTER ON DOOR
P-15	PAINT INSIDE FACE OF EXPOSED CMU. COLOR TO BE SHERWIN WILLIAMS, PASSIVE GRAY SW7064.

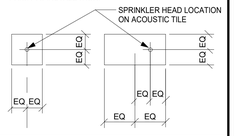
CEILING KEYNOTES

C#	DESCRIPTION
C-01	CABLE TRAY, REFER TO ELECTRICAL DWGS.
C-02	SERVER RACKS BELOW CEILING
C-03	2'X 4' SUSPENDED ACOUSTICAL TILE CEILING. REFER TO DETAIL 1/A9.01
C-04	EXIT SIGN, REFER TO EGRESS PLAN DRAWINGS AND ELECTRICAL DRAWINGS

CEILING LEGEND

- RECESSED CAN LIGHT FIXTURE
- FLUORESCENT LIGHT FIXTURE
- SUSPENDED LINEAR FLUORESCENT LIGHT FIXTURE
- SUPPLY AIR REGISTER
- RETURN AIR GRILLE
- EXHAUST FAN
- EXIT LIGHT
- + 1' - 0" A.F.F. — CEILING / SOFFIT HEIGHT (AS INDICATED ON CEILING PLAN)

SPRINKLER HEAD LAYOUT SHALL BE DETERMINED BY A LICENSED SPRINKLER CONTRACTOR, SPRINKLER HEAD LAYOUT TO BE APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION.



PARTITION LEGEND

- NON - RATED FRAMED WALL
- CMU - WALL

GENERAL NOTES

1.	DO NOT SCALE DRAWINGS
2.	NOTIFY THE ARCHITECT AND/OR OWNER OF ANY DISCREPANCIES AND/OR OMISSIONS PRIOR TO THE START OF WORK. WITHOUT NOTIFICTION, THE CONTRACTOR ASSUMES RESPONSIBILITY FOR ALL EXISTING CONDITIONS.
3.	ALL FINISHED CONSTRUCTION MUST MEET ADA AND TEXAS ACCESSIBILITY STANDARDS.
4.	DIMENSIONS ARE TO GRID LINE, FACE OF STUD, FACE OF MASONRY, FACE OF CONCRETE AND CENTER OF DOOR AND WINDOW OPENINGS UNLESS NOTED OTHERWISE.
5.	WALL TYPES WITH AN 'S' SUBSCRIPT INDICATE FIBERGLASS SOUND ATTENUATION BLANKETS FULL HEIGHT AND DEPTH TO EXTEND FROM THE TOP OF FLOOR SLAB TO THE UNDERSIDE OF STRUCTURE ABOVE. ON BOTH SIDES OF PARTITION THAT OTHERWISE WOULD NOT EXTEND TO THE STRUCTURE ABOVE, PROVIDE ACOUSTIC SEALANT AT TOP, BOTTOM AND BOTH SIDES OF WALL.
6.	PROVIDE 16GA. METAL STUDS IN LIEU OF 20/18 GA. METAL STUDS AT WALLS WITH ANY WALL HUNG TYPE ATTACHMENTS. PROVIDE FLAT METAL BRACING AS NEEDED. ALL TRADES TO SUPPLY AND INSTALL BACKING. OWNER REQUIRED BACKING BY GENERAL CONTRACTOR.
7.	DOOR OPENING FORCE ON ALL ENTRANCES AND EXITS SHALL BE 5 LBS MAX.
8.	FINISH MATERIALS TERMINATE AT INSIDE CORNERS UNLESS NOTED OTHERWISE.

REGISTERED ARCHITECT — STATE OF TEXAS

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
FLOOR PLAN & REFLECTED CEILING PLAN

DATE:
05/23/2019

JOB NO.:
18465.01

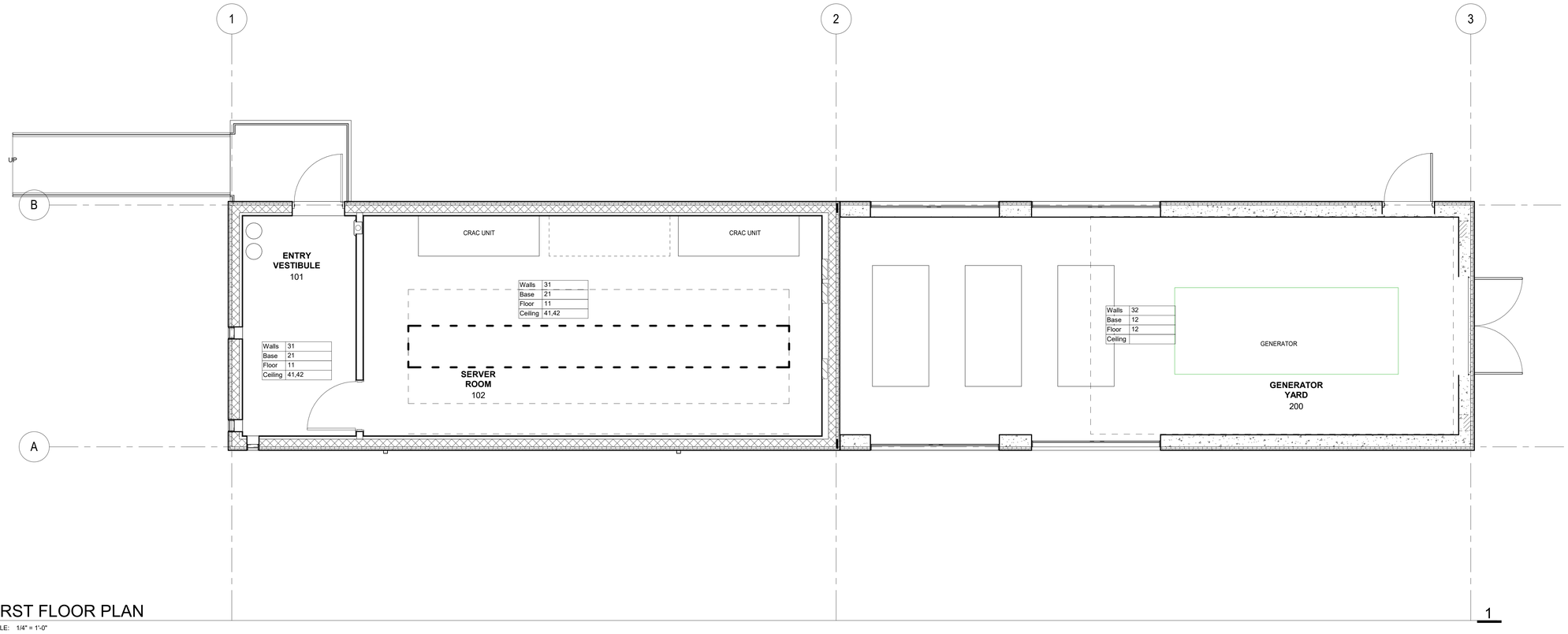
SHEET:
A1.01

ROOM FINISH MATERIAL NOTES

Sheet Note Number	ITEM	PRODUCT	MANUFACTURER	LINE	COLOR	DIMENSION
10	FLOORS					
11		RAISED FLOOR	GLOBAL IFS	TC1500	TECCRETE	24" X 24"
12		CONCRETE				
20	WALL BASE					
21		RUBBER WALL BASE	ROPPE	NO TOE	193 BLACK BROWN	4 1/4" X 8"
30	WALLS					
31		PAINT	SHERWIN WILLIAMS		JUBILEE SW 6248	
32		PAINT	SHERWIN WILLIAMS		PASSIVE GRAY SW 7064	
40	CEILING					
41		CEILING GRID	15/16" EXPOSED TEE SYSTEM	WHITE		
42		CEILING TILE	USG	MARS CLIMAPLUS CLEAN ROOM 88785	SQ DQUARE LAY-IN WHITE	2 X 4 X 3/4"

ROOM FINISH SCHEDULE

NUMBER	NAME	FLOOR	BASE	WALL FINISH NORTH	WALL FINISH EAST	WALL FINISH SOUTH	WALL FINISH WEST	CEILING	COMMENTS
101	ENTRY VESTIBULE	11	21	31	31	31	31	41,42	
102	SERVER ROOM	11	21	31	31	31	31	41,42	
200	GENERATOR YARD	12	12	32	32	32	32		



FIRST FLOOR PLAN

SCALE: 1/4" = 1'-0"

1

05/23/2019

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SHEET CONTENTS:
FINISH FLOOR PLAN

DATE:
05/23/2019

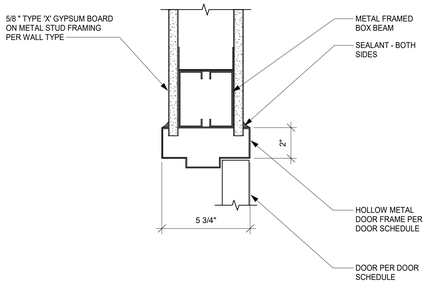
JOB NO.:
18465.01

SHEET:
A2.01

DOOR SCHEDULE

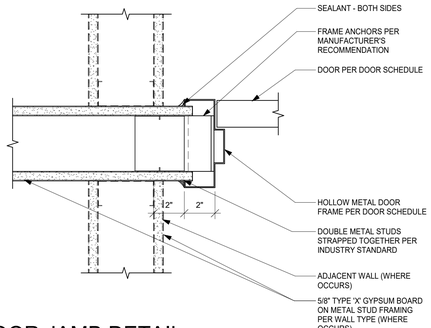
NUMBER	DOOR TYPE	DOOR WIDTH	DOOR HEIGHT	DOOR THICKNESS	FRAME MATERIAL	FRAME HEAD	FRAME JAMB	FRAME SILL	FIRE RATING	HARDWARE	COMMENTS
101	B	4' - 0"	7' - 0"	1 3/4"	HM	4/A2.11	5/A2.11	3/A2.11	90 MIN		AT ALTERNATE 1: SEE NOTE BELOW
102	A	4' - 0"	7' - 0"	1 3/4"	HM	1/A2.11	2/A2.11				
200A	C	8' - 0"	7' - 0"	1 3/4"	HM	7/A2.11	6/A2.11	3/A2.11			UNDERCUT DOOR 1"; AT ALTERNATE 1: SEE NOTE BELOW
200B	B	4' - 0"	7' - 0"	1 3/4"	HM	7/A2.11	6/A2.11	3/A2.11			UNDERCUT DOOR 1"; AT ALTERNATE 1: SEE NOTE BELOW

AT ALTERNATE 1: DOORS 101, 200A & 200B ARE TO BE STORM RATED FOR MISSILE IMPACT PER EF3 STORM RATING GUIDELINES



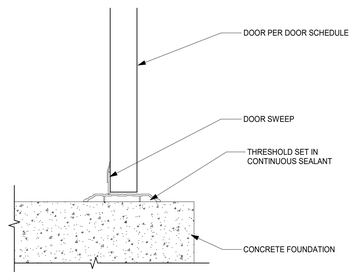
DOOR HEAD DETAIL 1

SCALE: 3" = 1'-0"



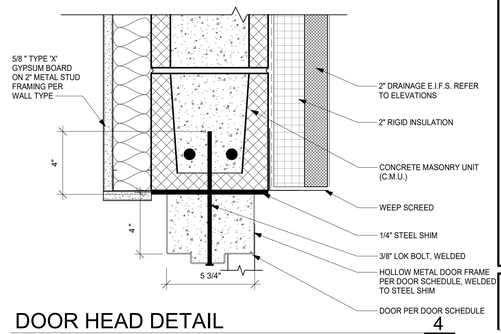
DOOR JAMB DETAIL 2

SCALE: 3" = 1'-0"



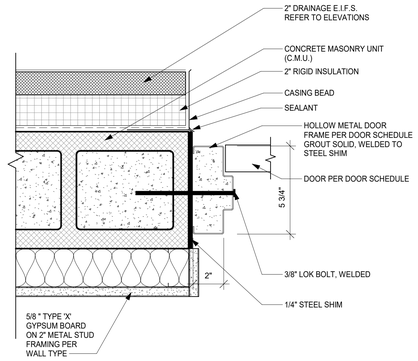
DOOR SILL DETAIL 3

SCALE: 3" = 1'-0"



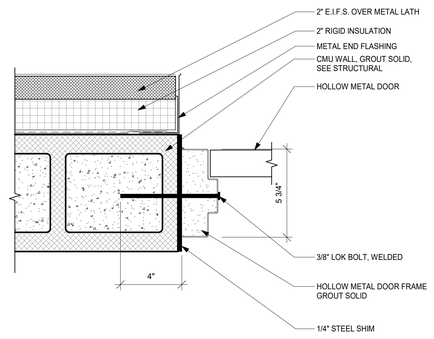
DOOR HEAD DETAIL 4

SCALE: 3" = 1'-0"



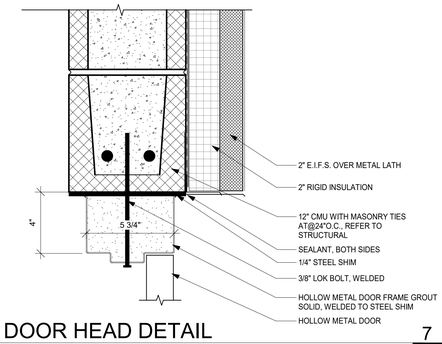
DOOR JAMB DETAIL 5

SCALE: 3" = 1'-0"



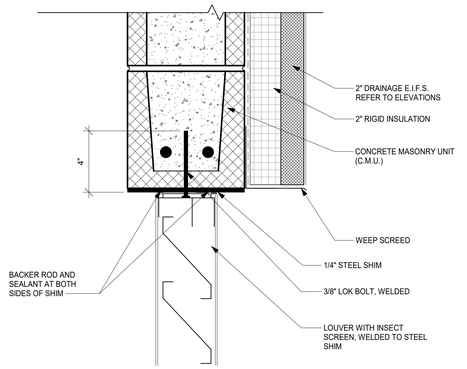
DOOR JAMB DETAIL 6

SCALE: 3" = 1'-0"



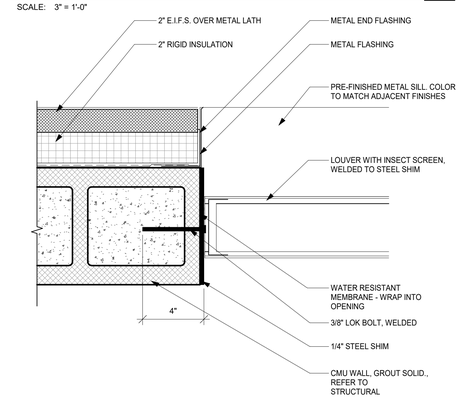
DOOR HEAD DETAIL 7

SCALE: 3" = 1'-0"



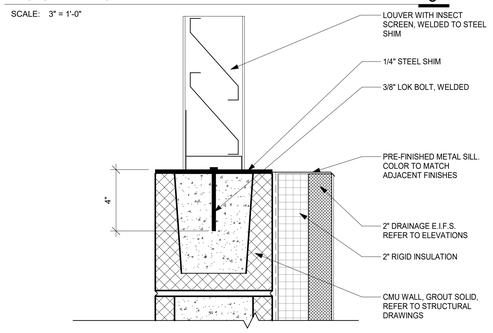
LOUVER HEAD DETAIL 8

SCALE: 3" = 1'-0"



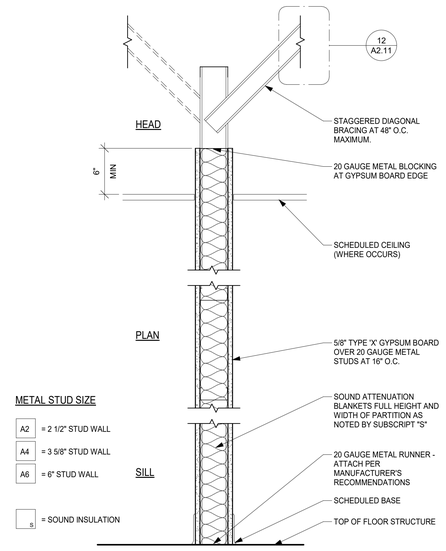
LOUVER JAMB DETAIL 9

SCALE: 3" = 1'-0"



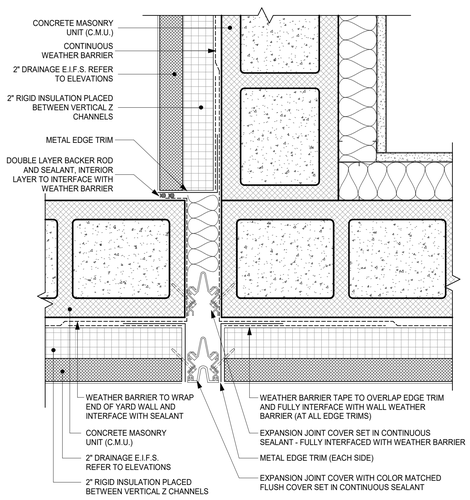
LOUVER SILL DETAIL 13

SCALE: 3" = 1'-0"



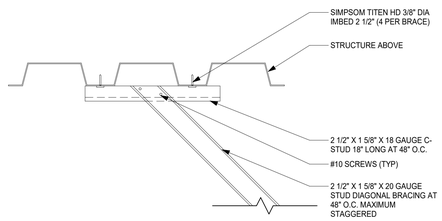
PARTITION TYPE - A 10

SCALE: 1 1/2" = 1'-0"



EXPANSION JOINT DETAIL 11

SCALE: 3" = 1'-0"



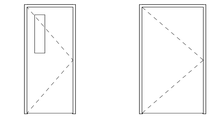
BRACING DETAIL 12

SCALE: 3" = 1'-0"

DOOR TYPE LEGEND

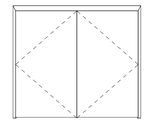
DESCRIPTION

DOOR TYPES



A
INTERIOR - SOLID CORE WOOD

B
EXTERIOR - HOLLOW METAL

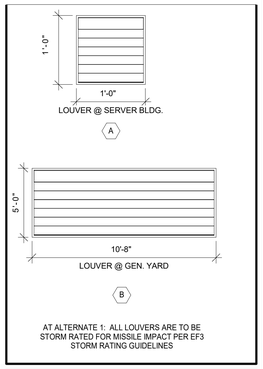


C
EXTERIOR - HOLLOW METAL

GENERAL DOOR & WINDOW NOTES

1. ● INDICATES TEMPERED GLASS
2. DO NOT SCALE DRAWINGS.
3. CONTRACTOR SHALL SITE VERIFY ALL DIMENSIONS. NOTIFY ARCHITECT AND/OR OWNER OF ANY DISCREPANCIES PRIOR TO THE START OF WORK. WITHOUT NOTIFICATION THE CONTRACTOR ASSUMES RESPONSIBILITY FOR ALL EXISTING CONDITIONS.
4. ALL INTERIOR FACES OF WOOD DOORS TO BE WILSONART PEWTER D73. ALL ITNERIOR FACES OF METAL DOORS AND DOOR FRAMES TO BE PAINTED SHERWIN WILLIAMS CITYSCAPE SW 7067. ALL EXTERIOR METAL DOORS AND DOOR FRAMES TO BE PAINTED TO MATCH ADJACENT FINISH.
5. DOOR HANDLES , PULL, LATCHES, LOCKS AND OTHER OPERATING DEVICES SHALL BE INSTALLED 34" MINIMUM AND 48" MAXIMUM ABOVE THE FINISH FLOOR AND SHALL HAVE A SHAPE THAT IS EASY TO GRASP WITH ONE HAND AND DOES NOT REQUIRE TIGHT GRASPING, PINCHING OR TWISTING OF THE WRIST TO OPERATE. LOCKS USED ONLY FOR SECURITY PURPOSES AND NOT USED FOR NORMAL OPERATION ARE PERMITTED AT ANY HEIGHT.

LOUVER TYPES



AT ALTERNATE 1: ALL LOUVERS ARE TO BE STORM RATED FOR MISSILE IMPACT PER EF3 STORM RATING GUIDELINES

ALTERNATES

ALTERNATE 1:

ALTERNATE 1 INCLUDES THE REPLACEMENT OF STANDARD STRUCTURAL SYSTEMS WITH HARDENED STRUCTURAL SYSTEMS TO ACHIEVE AN EF3 STORM RATING AS INDICATED ON STRUCTURAL DRAWINGS. HARDENED STRUCTURAL SYSTEMS INCLUDE EXTERIOR WALLS, YARD WALLS, AND ROOF ASSEMBLIES. THIS ALTERNATE ALSO INCLUDES THE ADDITION OF A REMOVABLE GRATE OVER THE MECHANICAL YARD. AS PART OF THIS ALTERNATE, STANDARD EXTERIOR DOORS AND LOUVERS ARE ALSO TO BE REPLACED WITH STORM RATED DOORS AND LOUVERS AS INDICATED ON SCHEDULES AND IN SPECIFICATIONS.

REGISTERED ARCHITECT STATE OF TEXAS
05/23/2019

REVISIONS:

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
DOOR SCHEDULE & DOOR DETAILS

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
A2.11

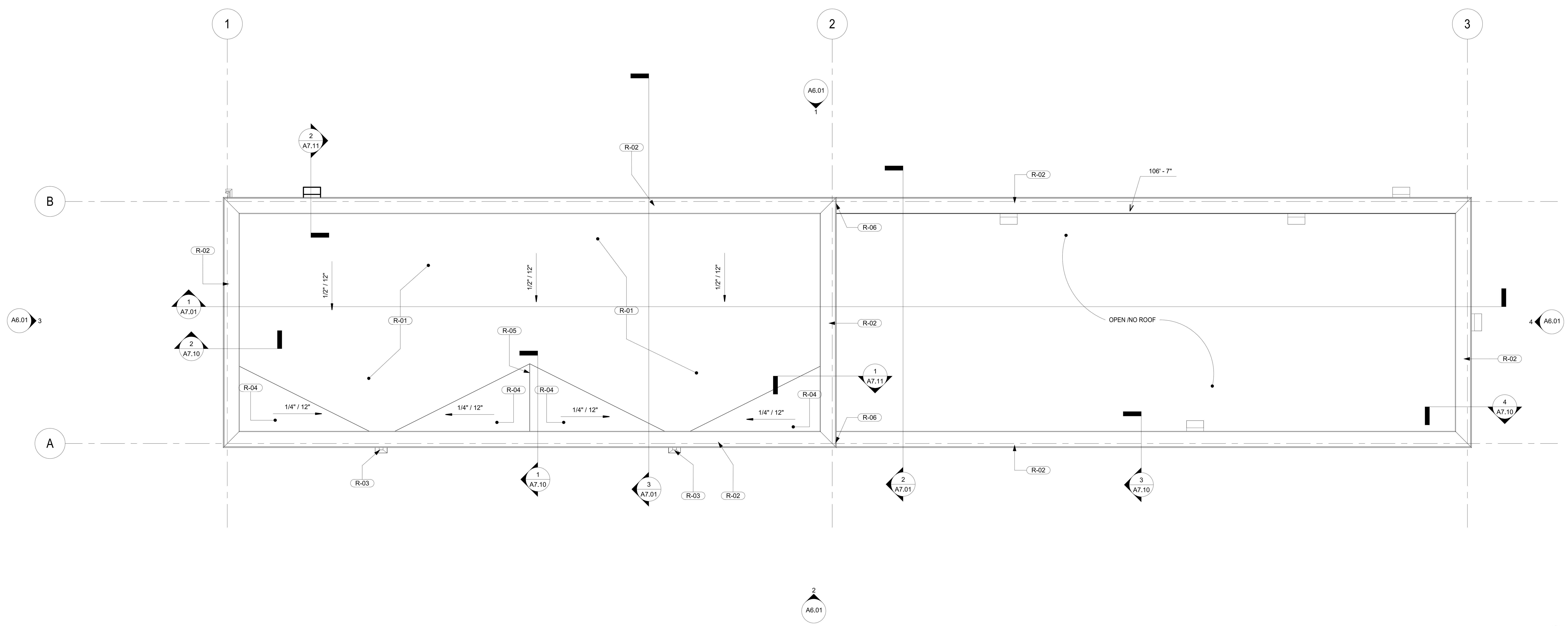
ALTERNATES

ALTERNATE 1:

ALTERNATE 1 INCLUDES THE REPLACEMENT OF STANDARD STRUCTURAL SYSTEMS WITH HARDENED STRUCTURAL SYSTEMS TO ACHIEVE AN EF3 STORM RATING AS INDICATED ON STRUCTURAL DRAWINGS. HARDENED STRUCTURAL SYSTEMS INCLUDE EXTERIOR WALLS, YARD WALLS, AND ROOF ASSEMBLIES. THIS ALTERNATE ALSO INCLUDES THE ADDITION OF A REMOVABLE GRATE OVER THE MECHANICAL YARD. AS PART OF THIS ALTERNATE, STANDARD EXTERIOR DOORS AND LOUVERS ARE ALSO TO BE REPLACED WITH STORM RATED DOORS AND LOUVERS AS INDICATED ON SCHEDULES AND IN SPECIFICATIONS.

ROOF KEYNOTES

R	DESCRIPTION
R-01	SINGLE PLY MEMBRANE ROOFING OVER R-25 RIGID INSULATION OVER STEEL ROOF DECK. SLOPE MIN 1/2" PER LINEAR FOOT; REF. R-08 FOR ALTERNATE DESIGN.
R-02	METAL CAP FLASHING SHOP PRIMED AND PAINTED TO MATCH ADJACENT MATERIAL
R-03	SCUPPER & DOWNSPOUT REFER TO DETAIL 3/A7.20
R-04	TAPERED RIGID INSULATION CRICKET UNDER ROOFING SYSTEM. SLOPE MIN 1/4" PER LINEAR FOOT
R-05	RIDGE LINE
R-06	EXPANSION JOINT, REFERENCE 12/A2.11
R-07	ALTERNATE 1 YARD ENCLOSURE - METAL GRATING OVER REMOVABLE STEEL BEAMS, REF. STRUCTURAL DRAWINGS
R-08	ALTERNATE 1 ROOF ASSEMBLY - SINGLE PLY MEMBRANE ROOFING UNDER PROTECTIVE CONCRETE SLAB, OVER R-25 RIGID INSULATION OVER COMPOSITE CONCRETE SLAB, REFER TO STRUCTURAL DRAWINGS FOR CONCRETE, SLOPE MIN 1/2" PER LINEAR FOOT
R-09	NO PROTECTIVE CONCRETE SLAB AT SCUPPER FLASHING, REFER TO DETAILS ON A7.20A
R-10	TAPER PROTECTIVE CONCRETE SLAB FOR 2'-0" AT ALL SIDES OF SCUPPER, REFER TO DETAISL ON A7.20A
R-11	PROVIDE SLOPE IN PROTECTIVE CONCRETE SLAB TO FOLLOW SLOPE OF CRICKETS BELOW



ROOF PLAN

SCALE: 1/4" = 1'-0"

1

GENERAL NOTES

1.	DO NOT SCALE DRAWINGS
2.	NOTIFY THE ARCHITECT AND/OR OWNER OF ANY DISCREPANCIES AND/OR OMISSIONS PRIOR TO THE START OF WORK. WITHOUT NOTIFICTION, THE CONTRACTOR ASSUMES RESPONSIBILITY FOR ALL EXISTING CONDITIONS.
3.	ALL FINISHED CONSTRUCTION MUST MEET ADA AND TEXAS ACCESSIBILITY STANDARDS.
4.	DIMENSIONS ARE TO GRID LINE, FACE OF STUD, FACE OF MASONRY, FACE OF CONCRETE AND CENTER OF DOOR AND WINDOW OPENINGS UNLESS NOTED OTHERWISE.
5.	WALL TYPES WITH AN 'S' SUBSCRIPT INDICATE FIBERGLASS SOUND ATTENUATION BLANKETS FULL HEIGHT AND DEPTH TO EXTEND FROM THE TOP OF FLOOR SLAB TO THE UNDERSIDE OF STRUCTURE ABOVE. ON BOTH SIDES OF PARTITION THAT OTHERWISE WOULD NOT EXTEND TO THE STRUCTURE ABOVE, PROVIDE ACOUSTIC SEALANT AT TOP, BOTTOM AND BOTH SIDES OF WALL.
6.	PROVIDE 16GA. METAL STUDS IN LIEU OF 20/18 GA. METAL STUDS AT WALLS WITH ANY WALL HUNG TYPE ATTACHMENTS. PROVIDE FLAT METAL BRACING AS NEEDED. ALL TRADES TO SUPPLY AND INSTALL BACKING. OWNER REQUIRED BACKING BY GENERAL CONTRACTOR.
7.	DOOR OPENING FORCE ON ALL ENTRANCES AND EXITS SHALL BE 5 LBS MAX
8.	FINISH MATERIALS TERMINATE AT INSIDE CORNERS UNLESS NOTED OTHERWISE.

REGISTERED ARCHITECT — STATE OF TEXAS

05/23/2019

REVISIONS:

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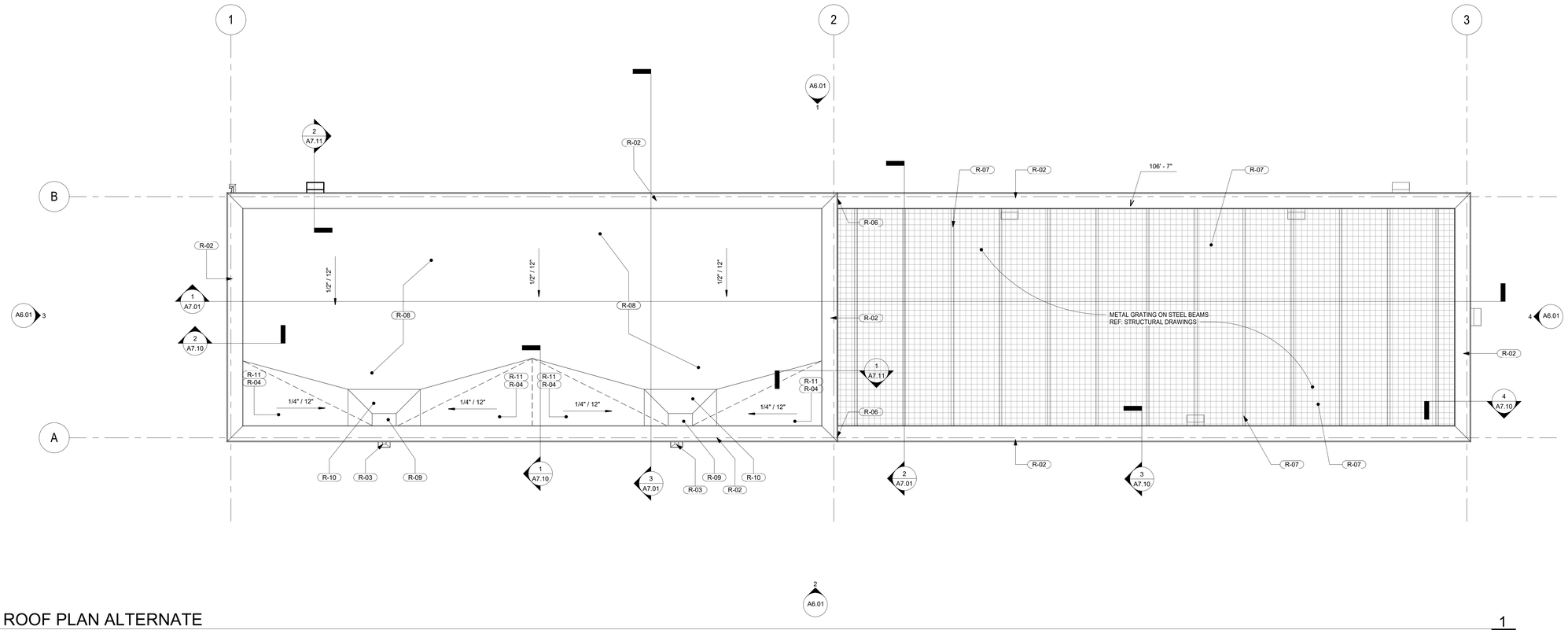
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
ROOF PLAN

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
A4.01



ROOF PLAN ALTERNATE

SCALE: 1/4" = 1'-0"

2
A6.01

1

ROOF KEYNOTES

R	DESCRIPTION
R-01	SINGLE PLY MEMBRANE ROOFING OVER R-25 RIGID INSULATION OVER STEEL ROOF DECK. SLOPE MIN 1/2" PER LINEAR FOOT; REF. R-08 FOR ALTERNATE DESIGN.
R-02	METAL CAP FLASHING SHOP PRIMED AND PAINTED TO MATCH ADJACENT MATERIAL
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R-09	NO PROTECTIVE CONCRETE SLAB AT SCUPPER FLASHING, REFER TO DETAILS ON A7.20A
R-10	TAPER PROTECTIVE CONCRETE SLAB FOR 2'-0" AT ALL SIDES OF SCUPPER, REFER TO DETAISL ON A7.20A
R-11	PROVIDE SLOPE IN PROTECTIVE CONCRETE SLAB TO FOLLOW SLOPE OF CRICKETS BELOW

GENERAL NOTES

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4.	DIMENSIONS ARE TO GRID LINE, FACE OF STUD, FACE OF MASONRY, FACE OF CONCRETE AND CENTER OF DOOR AND WINDOW OPENINGS UNLESS NOTED OTHERWISE.
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REGISTERED ARCHITECT
STATE OF TEXAS
05/23/2019

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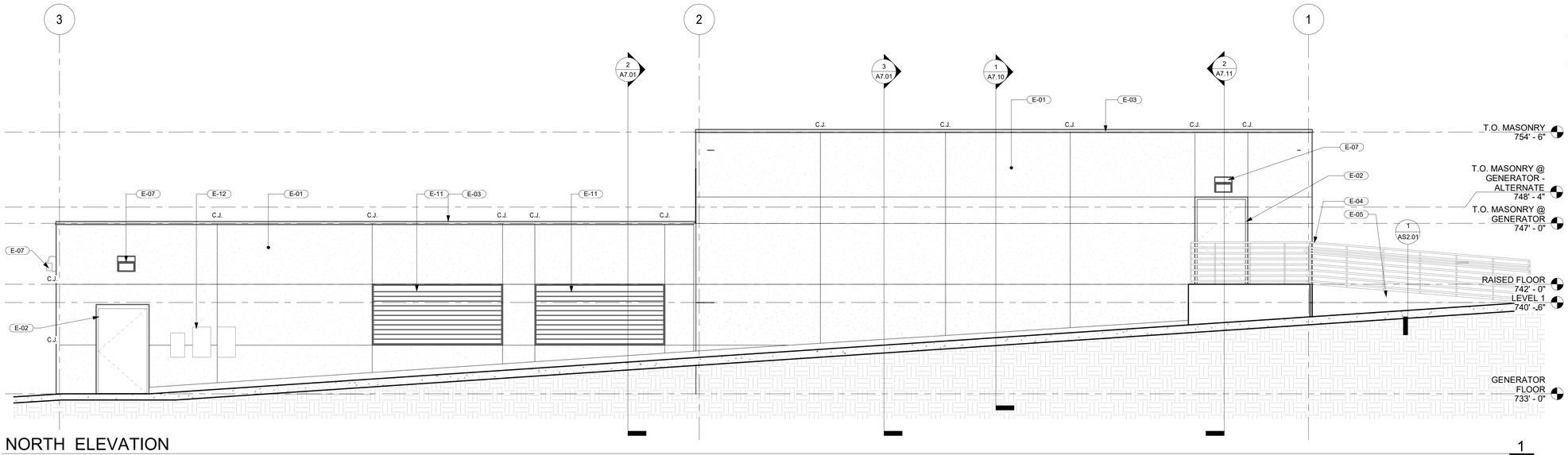
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
ROOF PLAN ALTERNATE

DATE:
05/23/2019

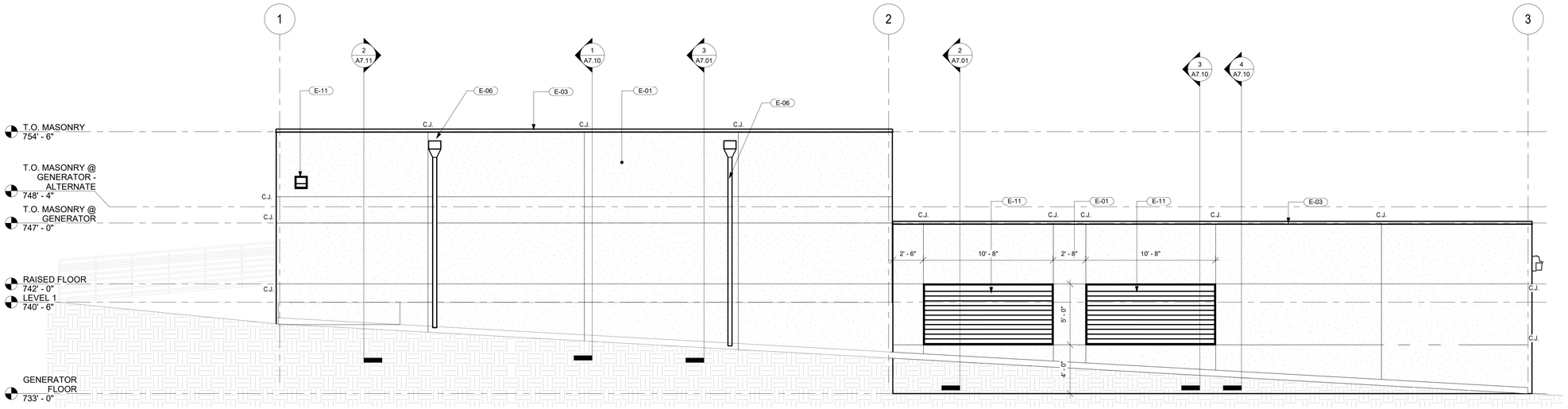
JOB NO.:
18465.01

SHEET:
A4.01A



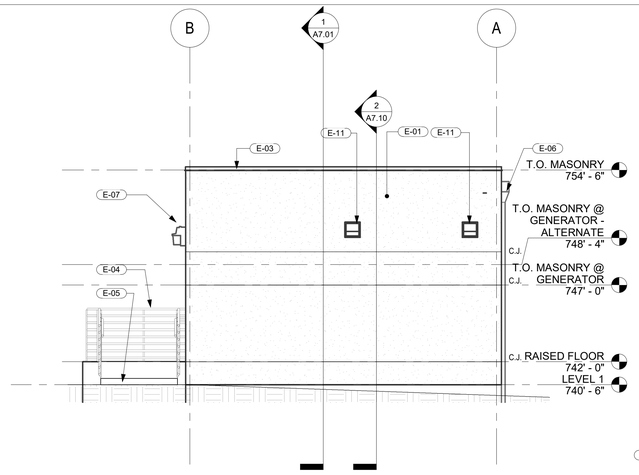
NORTH ELEVATION 1

SCALE: 1/4" = 1'-0"



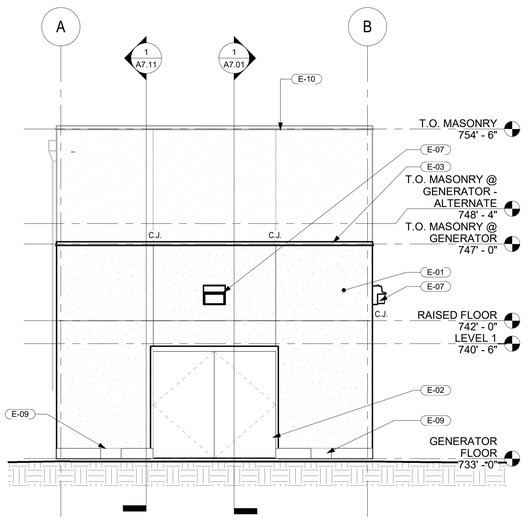
SOUTH ELEVATION 2

SCALE: 1/4" = 1'-0"



WEST ELEVATION 3

SCALE: 1/4" = 1'-0"



EAST ELEVATION 4

SCALE: 1/4" = 1'-0"

EXTERIOR ELEVATION KEYNOTES

E#	DESCRIPTION
E-01	DRAINAGE IMPACT RESISTANT EIFS. COLOR TO BE SW 6386
E-02	DOOR, REFER TO DOOR SCHEDULE.
E-03	METAL CAP, COLOR TO MATCH ADJACENT SURFACE
E-04	PAINTED METAL RAILINGS, REFER TO SPECS, COLOR TO BE SHERWIN WILLIAMS, PASSIVE GRAY SW7064.
E-05	CONCRETE RAMP & LANDING, REFER TO STRUCTURAL DRAWINGS
E-06	DOWNSPOUTS, PAINT TO MATCH ADJACENT WALLS
E-07	EXTERIOR LIGHTING FIXTURE, REFER TO ELECTRICAL DRAWINGS
E-09	8" WIDE WATER DRAINAGE OPENING
E-10	BUILDING BEYOND
E-11	METAL LOUVER. REFER TO WINDOW SCHEDULE. COLOR TO MATCH ADJACENT WALL
E-12	ELECTRICAL PANELS, REFER TO ELECTRICAL DRAWINGS

ALTERNATES

ALTERNATE 1:

ALTERNATE 1 INCLUDES THE REPLACEMENT OF STANDARD STRUCTURAL SYSTEMS WITH HARDENED STRUCTURAL SYSTEMS TO ACHIEVE AN EF3 STORM RATING AS INDICATED ON STRUCTURAL DRAWINGS. HARDENED STRUCTURAL SYSTEMS INCLUDE EXTERIOR WALLS, YARD WALLS, AND ROOF ASSEMBLIES. THIS ALTERNATE ALSO INCLUDES THE ADDITION OF A REMOVABLE GRATE OVER THE MECHANICAL YARD, AS PART OF THIS ALTERNATE, STANDARD EXTERIOR DOORS AND LOUVERS ARE ALSO TO BE REPLACED WITH STORM RATED DOORS AND LOUVERS AS INDICATED ON SCHEDULES AND IN SPECIFICATIONS.

REGISTERED ARCHITECT STATE OF TEXAS

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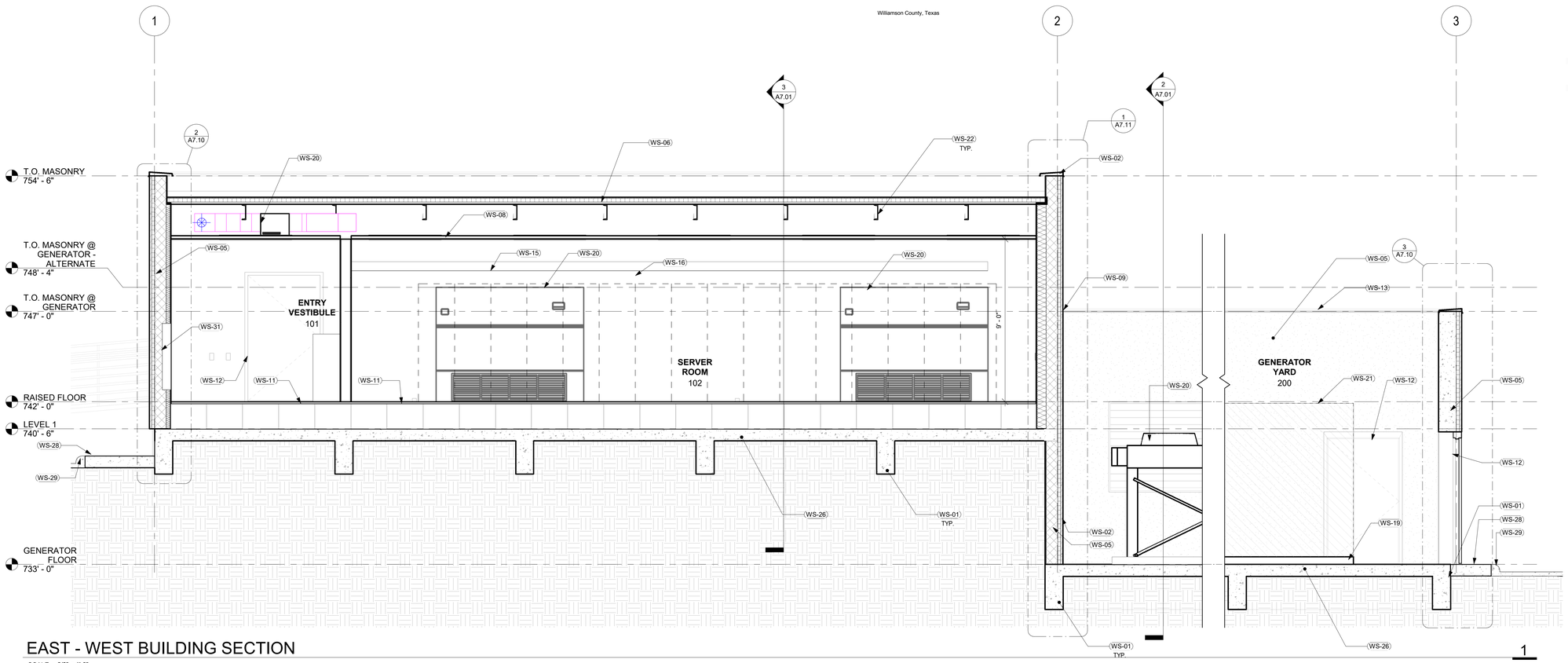
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
EXTERIOR ELEVATIONS

DATE:
05/23/2019

JOB NO.:
18465.01

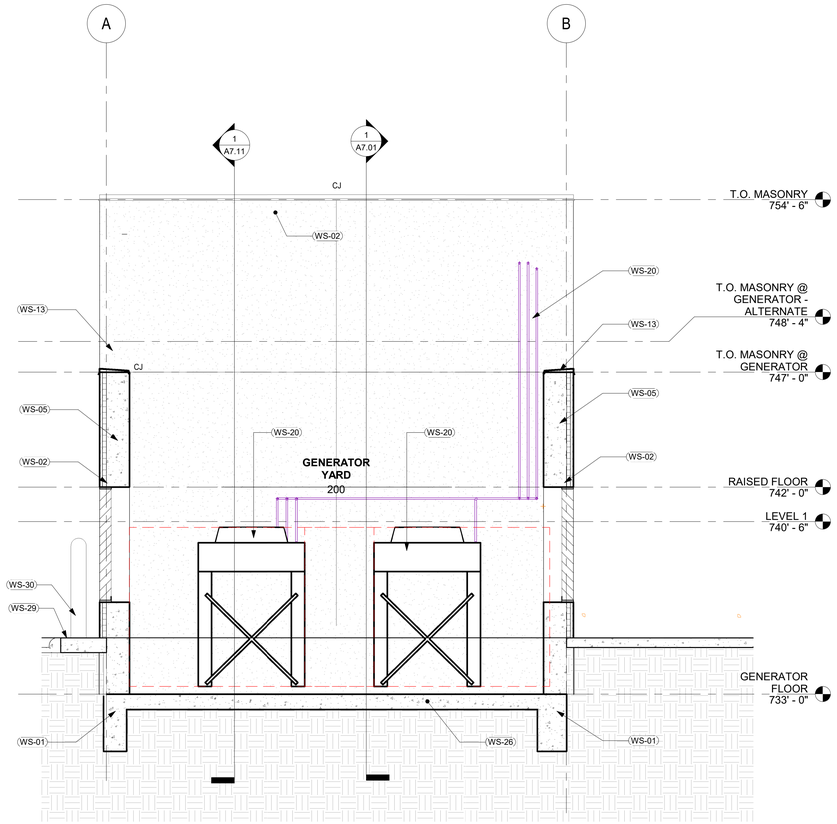
SHEET:
A6.01



EAST - WEST BUILDING SECTION

SCALE: 3/8" = 1'-0"

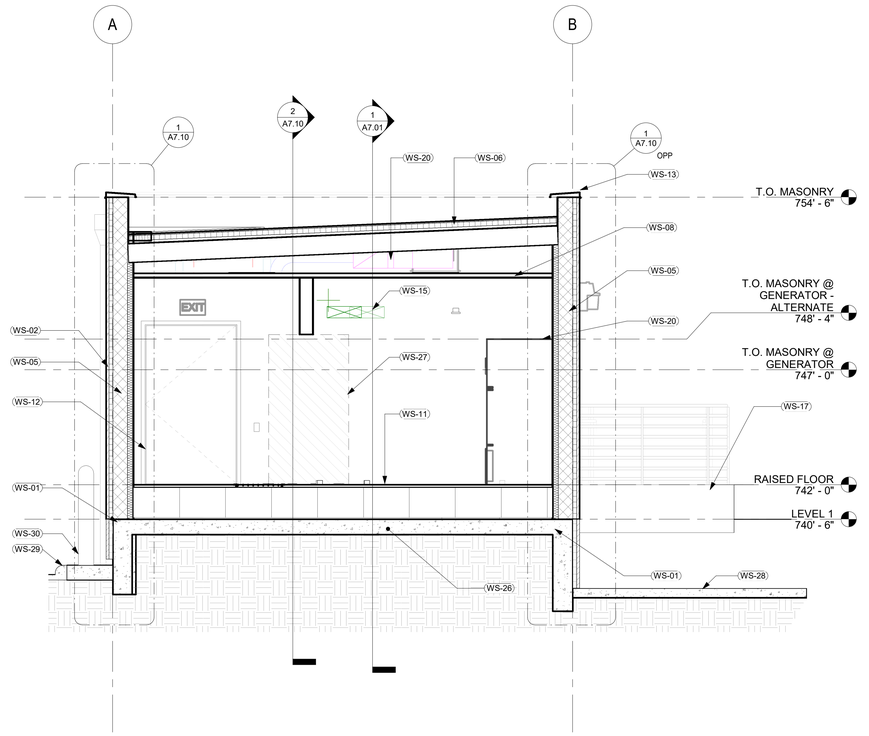
1



BLDG SECTION THRU GEN YARD

SCALE: 3/8" = 1'-0"

2



NORTH - SOUTH ELEVATION

SCALE: 3/8" = 1'-0"

3

WALL SECTION KEYNOTES

S#	DESCRIPTION
WS-01	CONCRETE FOUNDATION, REFER TO STRUCTURAL DRAWINGS
WS-02	2" DRAINAGE IMPACT RESISTANT EIFS
WS-03	5/8" TYPE X GYPSUM BOARD
WS-04	2" RIGID INSULATION
WS-05	8" CONCRETE MASONRY UNIT, REFER TO STRUCTURAL
WS-06	SINGLE PLY MEMBRANE ROOFING OVER 1/2" ROOF SHEATHING OVER R-20 RIGID INSULATION OVER STEEL ROOF DECK/ REF. 1/A7.20A FOR ALTERNATE
WS-08	CEILING, REFER TO CEILING PLAN
WS-09	EXPANSION JOINT, REFER TO DETAIL 11/A2.11
WS-10	OPENING @ BASE OF WALL FOR WATER DRAINAGE
WS-11	RAISED FLOOR SYSTEM, REFER TO SPECS
WS-12	SCHEDULED DOOR.
WS-13	METAL DRIP FLASHING, COLOR TO MATCH ADJACENT FINISH
WS-15	CABLE TRAY, REFERENCE ELECTRICAL
WS-16	SERVER RACKS, OFOI
WS-17	RAMP BEYOND.
WS-19	CONCRETE PAD
WS-20	MECHANICAL EQUIPMENT, REFER TO MECHANICAL DRAWINGS
WS-21	GENERATOR, BY OTHERS
WS-22	STRUCTURAL ROOF FRAMING, REFER TO STRUCTURAL DRAWINGS
WS-23	CONCRETE RAMP LANDING. REFER TO STRUCTURAL DRAWINGS.
WS-24	GUARD RAIL, SEE EXT. ELEVATION FOR COLOR
WS-25	WATERPROOFING.
WS-26	CONCRETE SLAB.
WS-27	SERVER RACK OFOI.
WS-28	NEW SIDEWALK, REFERENCE CIVIL DRAWINGS
WS-29	NEW CURB REFERENCE CIVIL DRAWINGS
WS-30	BOLLARD BEYOND, REFERENCE 4/AS2.01
WS-31	ELECTRICAL PANEL, REFER TO ELECTRICAL DRAWINGS
WS-32	5/8" GYPSUM BOARD ON METAL STUDS W/ BATT INSULATION
WS-33	REF. 1/A7.20A & 1/A4.014A FOR ROOF ALTERNATE DETAILS

ALTERNATES

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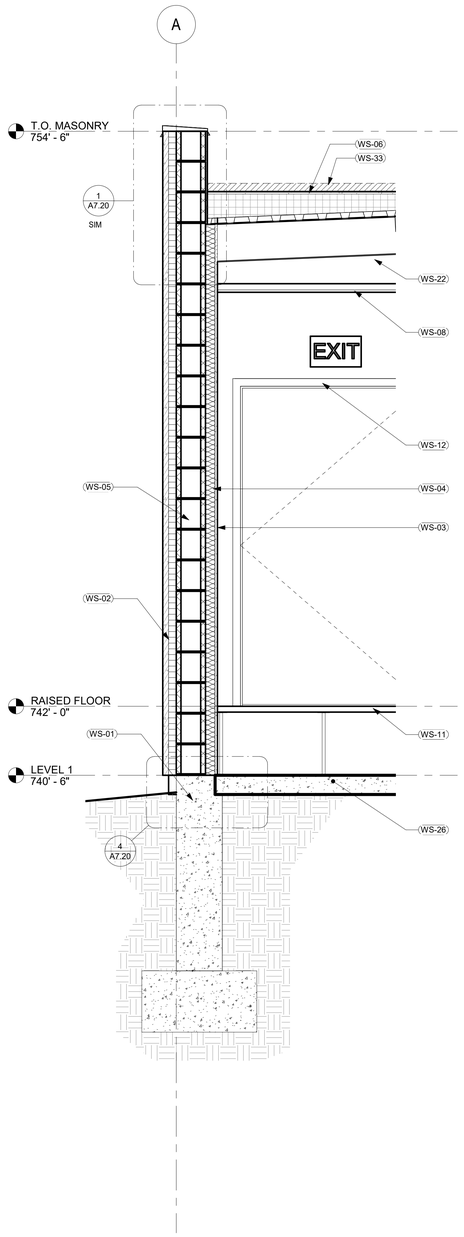
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
BUILDING SECTIONS

DATE:
05/23/2019

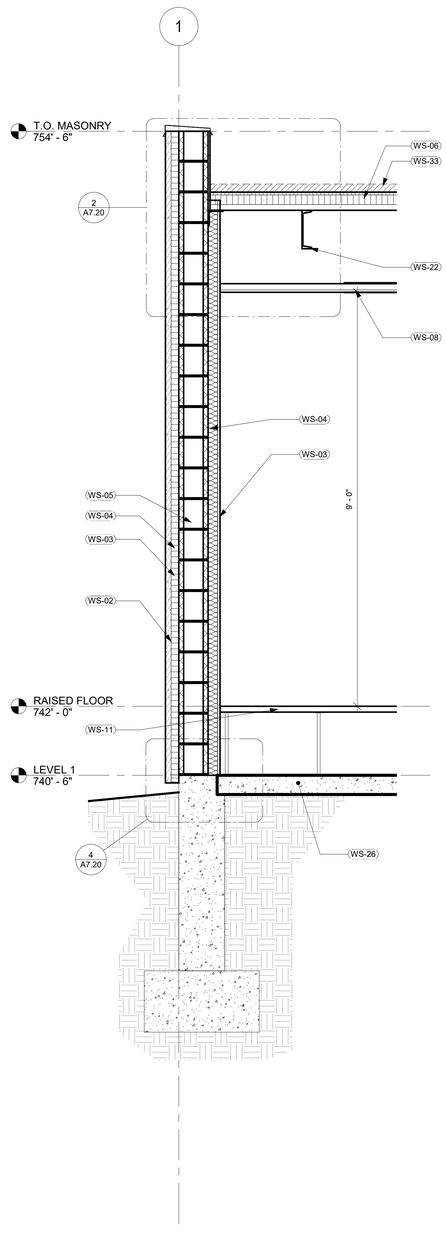
JOB NO.:
18465.01

SHEET:
A7.01



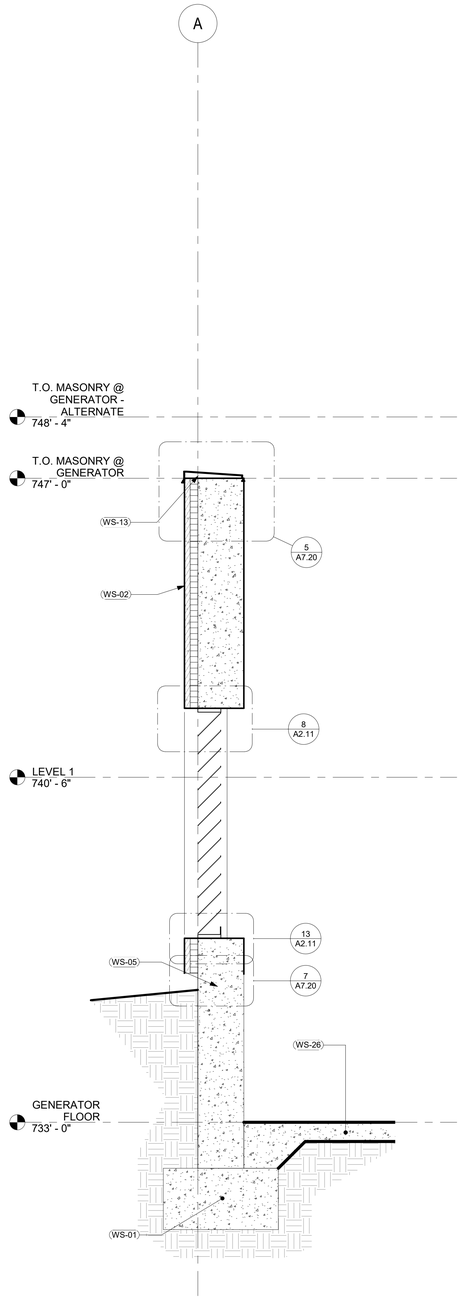
WALL SECTION @ CMU SOUTH 1

SCALE: 3/4" = 1'-0"



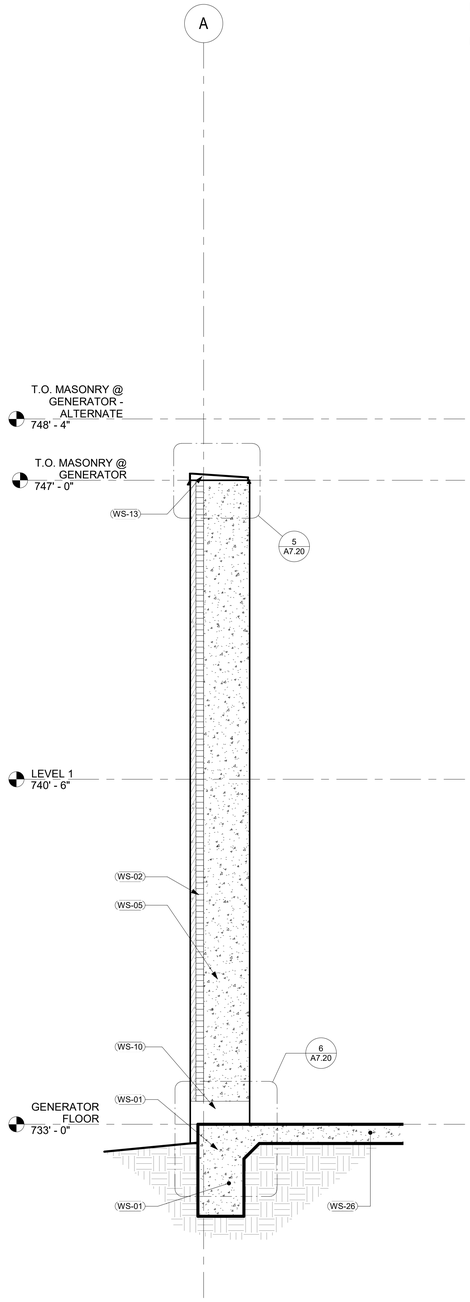
WALL SECTION @ CMU WEST 2

SCALE: 3/4" = 1'-0"



WALL SECTION @ GEN YARD 3

SCALE: 3/4" = 1'-0"



WALL SECTION @ GEN YARD 4

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WALL SECTION KEYNOTES

S#	DESCRIPTION
WS-01	CONCRETE FOUNDATION, REFER TO STRUCTURAL DRAWINGS
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WS-06	SINGLE PLY MEMBRANE ROOFING OVER 1/2" ROOF SHEATHING OVER R-20 RIGID INSULATION OVER STEEL ROOF DECK/ REF. 1/A7.20A FOR ALTERNATE
WS-08	CEILING, REFER TO CEILING PLAN
WS-09	EXPANSION JOINT, REFER TO DETAIL 11/A2.11
WS-10	OPENING @ BASE OF WALL FOR WATER DRAINAGE
WS-11	RAISED FLOOR SYSTEM, REFER TO SPECS
WS-12	SCHEDULED DOOR.
WS-13	METAL DRIP FLASHING, COLOR TO MATCH ADJACENT FINISH
WS-15	CABLE TRAY, REFERENCE ELECTRICAL
WS-16	SERVER RACKS, OFOI
WS-17	RAMP BEYOND.
WS-19	CONCRETE PAD
WS-20	MECHANICAL EQUIPMENT, REFER TO MECHANICAL DRAWINGS
WS-21	GENERATOR, BY OTHERS
WS-22	STRUCTURAL ROOF FRAMING, REFER TO STRUCTURAL DRAWINGS
WS-23	CONCRETE RAMP LANDING. REFER TO STRUCTURAL DRAWINGS.
WS-24	GUARD RAIL, SEE EXT. ELEVATION FOR COLOR
WS-25	WATERPROOFING.
WS-26	CONCRETE SLAB.
WS-27	SERVER RACK OFOI.
WS-28	NEW SIDEWALK, REFERENCE CIVIL DRAWINGS
WS-29	NEW CURB REFERENCE CIVIL DRAWINGS
WS-30	BOLLARD BEYOND, REFERENCE 4/AS2.01
WS-31	ELECTRICAL PANEL, REFER TO ELECTRICAL DRAWINGS
WS-32	5/8" GYPSUM BOARD ON METAL STUDS W/ BATT INSULATION
WS-33	REF. 1/A7.20A & 1/A4.014A FOR ROOF ALTERNATE DETAILS

ALTERNATES

ALTERNATE 1:

ALTERNATE 1 INCLUDES THE REPLACEMENT OF STANDARD STRUCTURAL SYSTEMS WITH HARDENED STRUCTURAL SYSTEMS TO ACHIEVE AN EF3 STORM RATING AS INDICATED ON STRUCTURAL DRAWINGS. HARDENED STRUCTURAL SYSTEMS INCLUDE EXTERIOR WALLS, YARD WALLS, AND ROOF ASSEMBLIES. THIS ALTERNATE ALSO INCLUDES THE ADDITION OF A REMOVABLE GRATE OVER THE MECHANICAL YARD. AS PART OF THIS ALTERNATE, STANDARD EXTERIOR DOORS AND LOUVERS ARE ALSO TO BE REPLACED WITH STORM RATED DOORS AND LOUVERS AS INDICATED ON SCHEDULES AND IN SPECIFICATIONS.

REGISTERED ARCHITECT STATE OF TEXAS

05/23/2019

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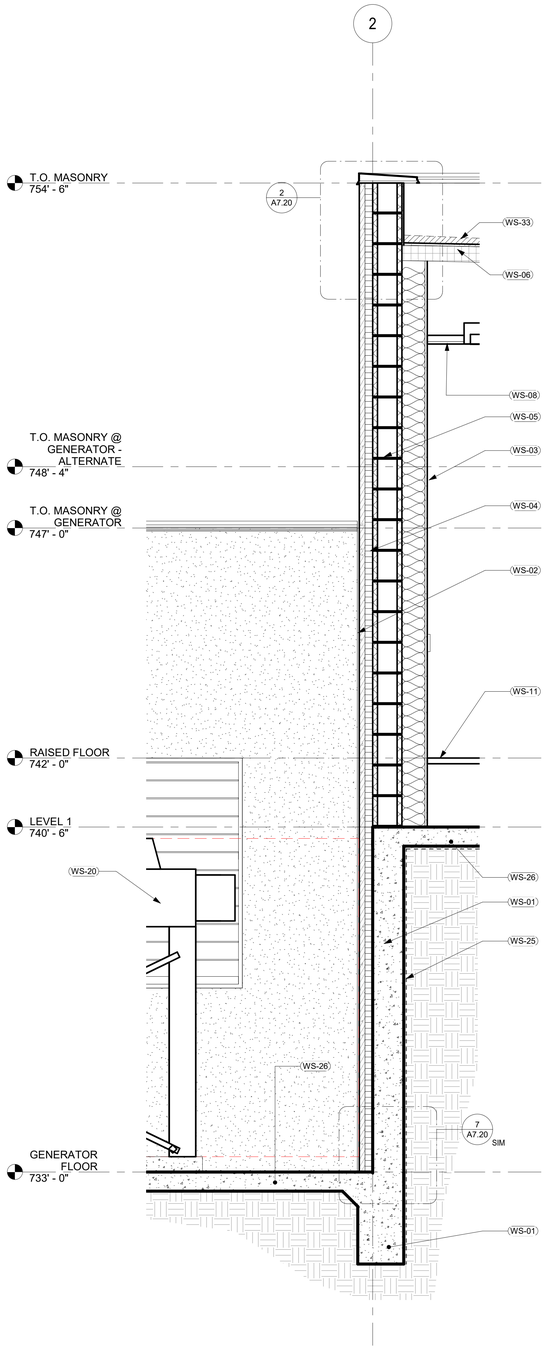
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
WALL SECTIONS

DATE:
05/23/2019

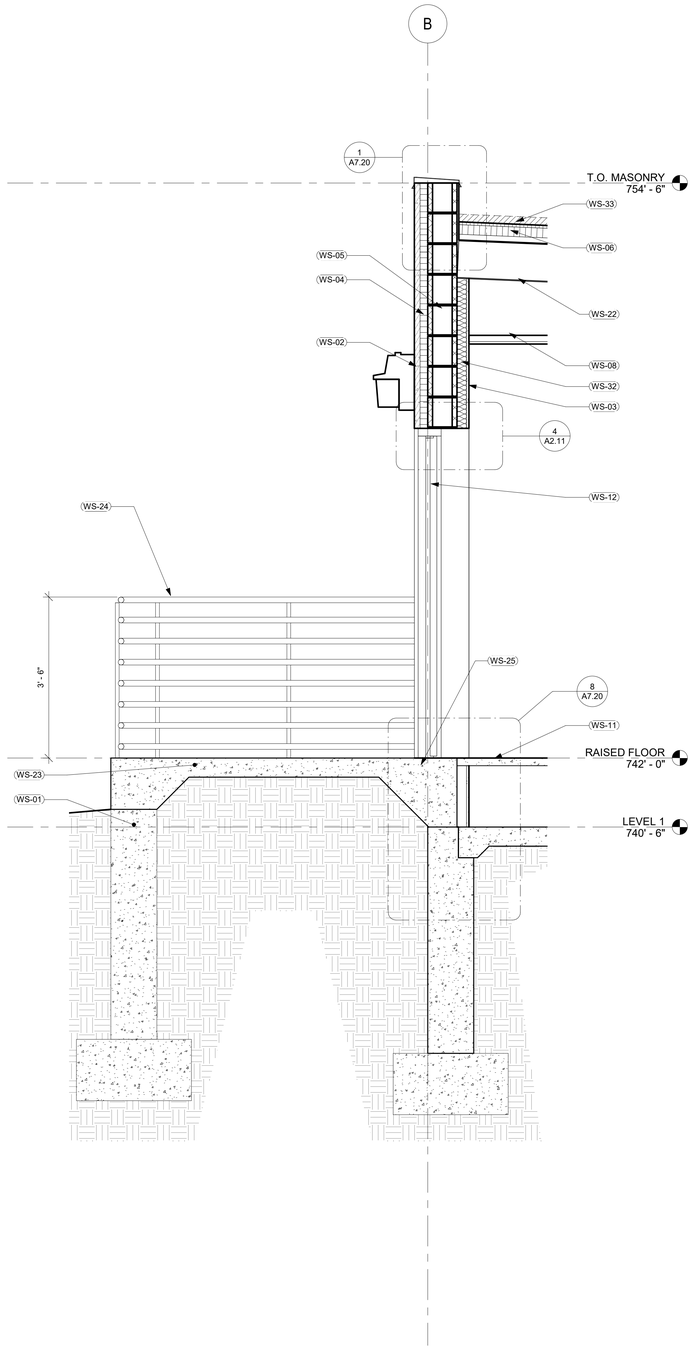
JOB NO.
18465.01

SHEET:
A7.10



WALL SECTION @ CMU ROOM/YARD 1

SCALE: 3/4" = 1'-0"



WALL SECTION @ ENTRY DOOR 2

SCALE: 3/4" = 1'-0"

WALL SECTION KEYNOTES

S#	DESCRIPTION
WS-01	CONCRETE FOUNDATION, REFER TO STRUCTURAL DRAWINGS
WS-02	2" DRAINAGE IMPACT RESISTANT EIFS
WS-03	5/8" TYPE X GYPSUM BOARD
WS-04	2" RIGID INSULATION
WS-05	8" CONCRETE MASONRY UNIT, REFER TO STRUCTURAL
WS-06	SINGLE PLY MEMBRANE ROOFING OVER 1/2" ROOF SHEATHING OVER R-20 RIGID INSULATION OVER STEEL ROOF DECK/ REF. 1/A7.20A FOR ALTERNATE
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PROJECT:
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SHEET CONTENTS:
WALL SECTIONS

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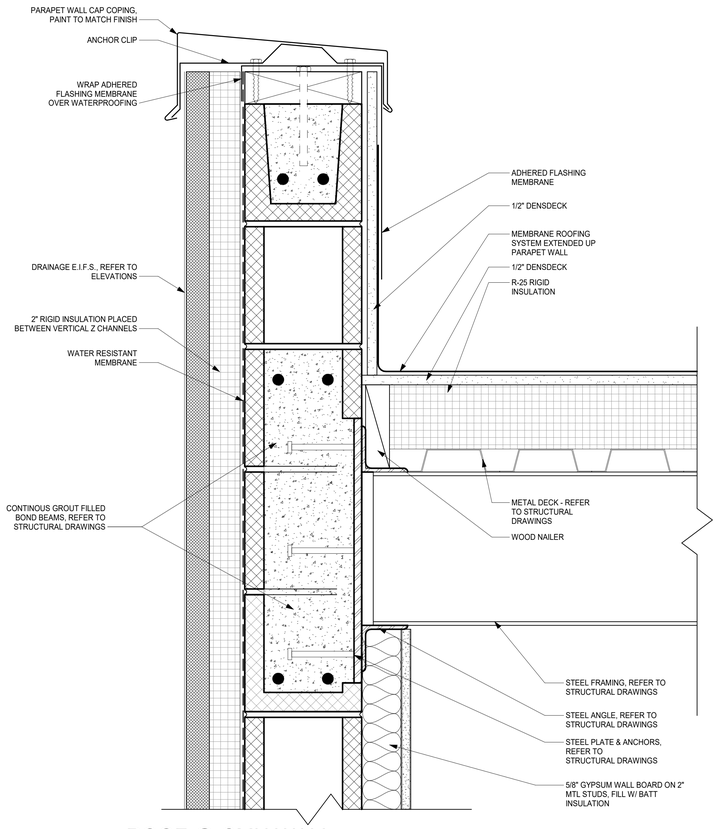
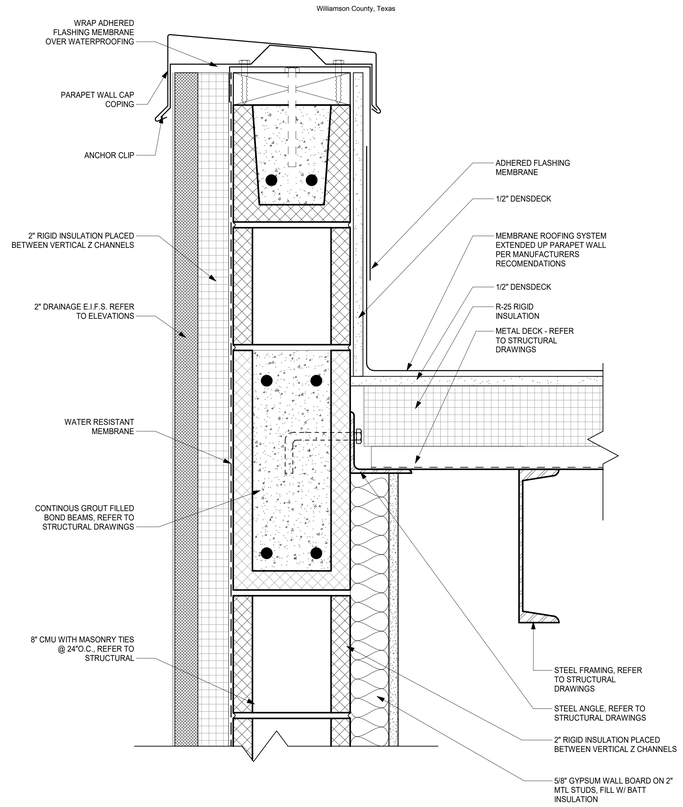
18465.01

SHEET:
A7.11



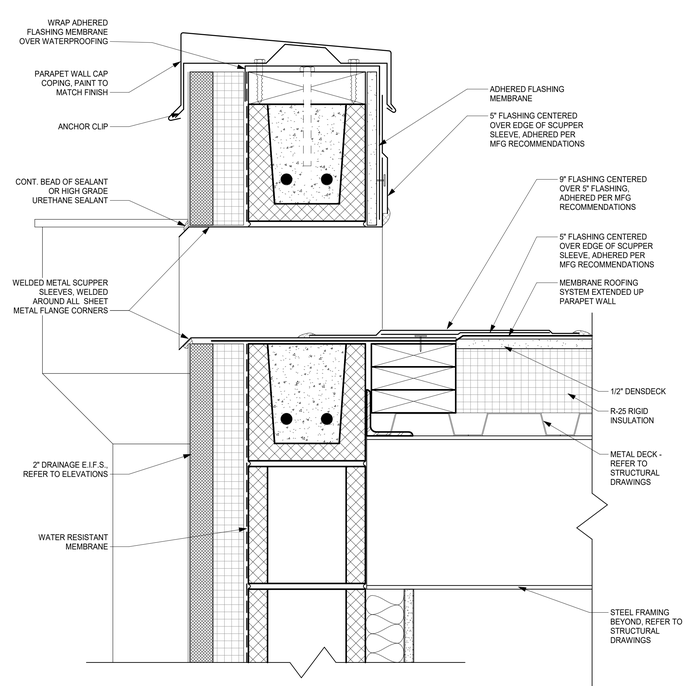
ROOF @ CMU WALL 1

SCALE: 3" = 1'-0"



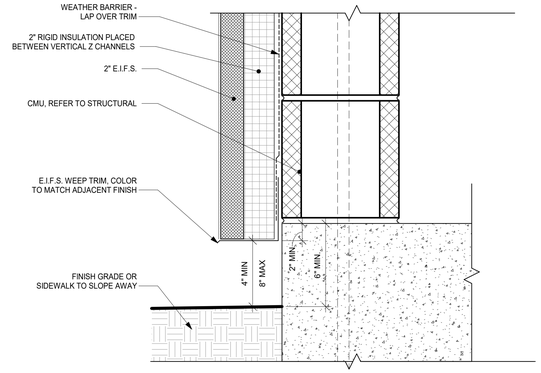
ROOF @ CMU WALL 2

SCALE: 3" = 1'-0"



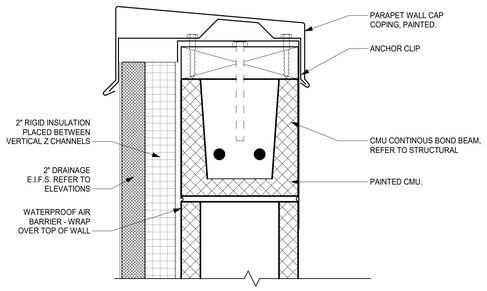
ROOF @ CMU WALL SCUPPER 3

SCALE: 3" = 1'-0"



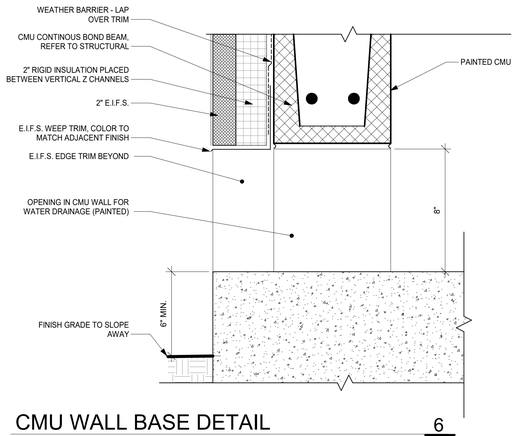
CMU WALL BASE DETAIL 4

SCALE: 3" = 1'-0"



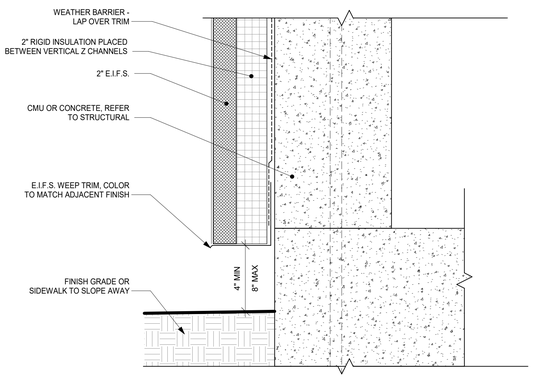
WALL CAP @ CMU (CONCRETE SIM) 5

SCALE: 3" = 1'-0"



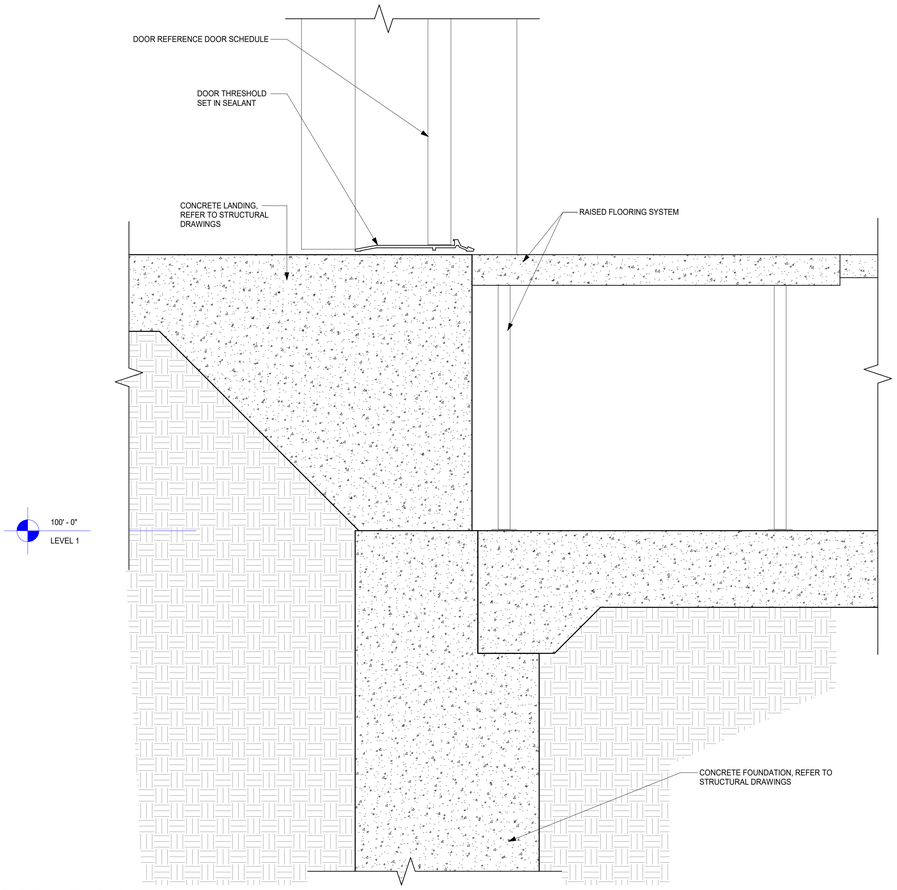
CMU WALL BASE DETAIL 6

SCALE: 3" = 1'-0"



CONCRETE WALL BASE DETAIL 7

SCALE: 3" = 1'-0"



DOOR HEAD DETAIL 8

SCALE: 3" = 1'-0"

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
BUILDING DETAILS

DATE:
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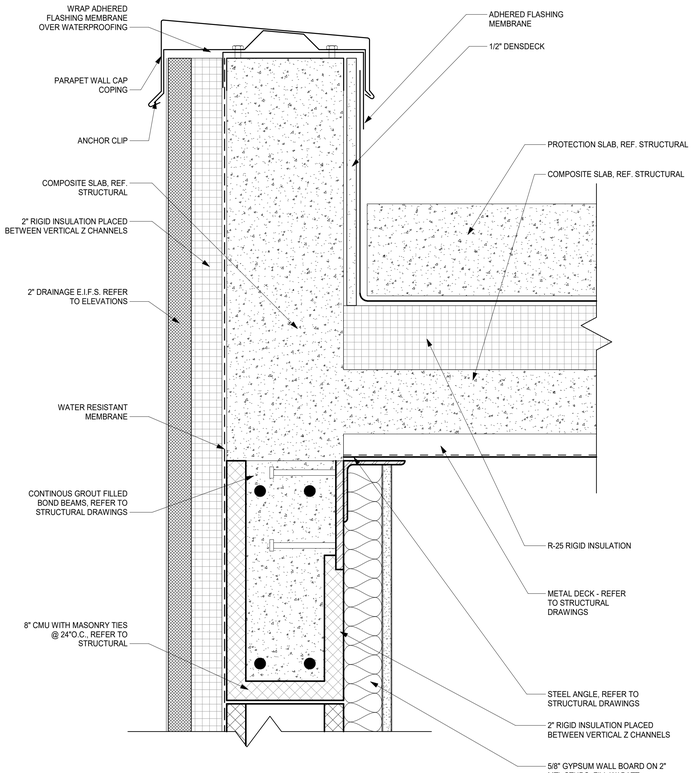
JOB NO.:
18465.01

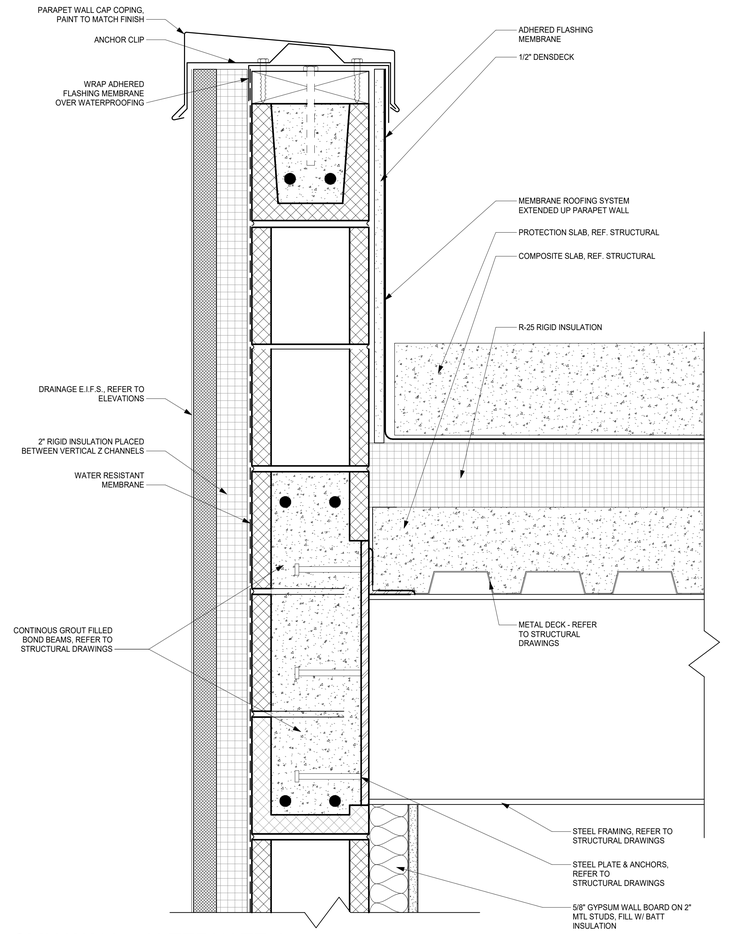
SHEET:
A7.20



ROOF @ CMU WALL - ALTERNATE 1

2

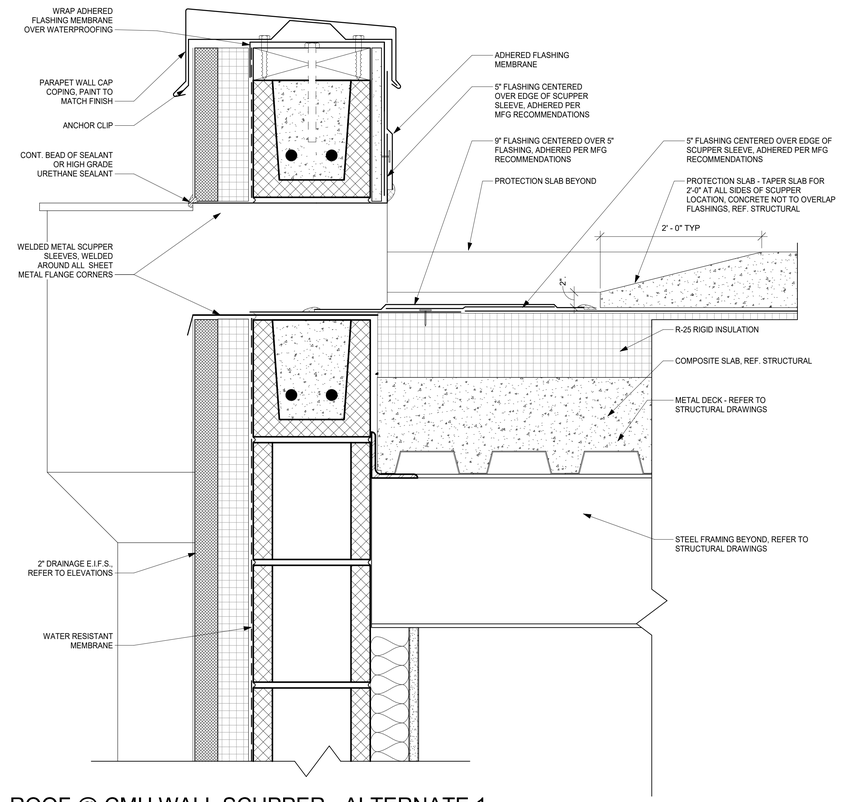
SCALE: 3" = 1'-0"



ROOF @ CMU WALL - ALTERNATE 1

1

SCALE: 3" = 1'-0"



ROOF @ CMU WALL SCUPPER - ALTERNATE 1

3

SCALE: 3" = 1'-0"

Bid 1906-328

REGISTERED ARCHITECT STATE OF TEXAS
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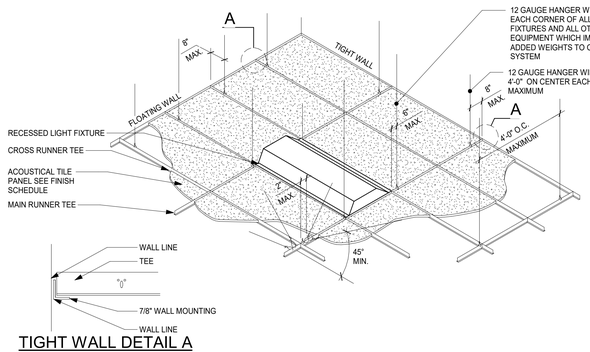
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
ALTERNATE BUILDING DETAILS

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
A7.20A



TIGHT WALL DETAIL A

CEILING NOTES:

REQUIREMENTS FOR SUSPENDED CEILING SYSTEMS ARE BASED ON SEISMIC DESIGN CATEGORY A OR B.

THE SUSPENDED CEILING SYSTEM, MECHANICAL DUCTWORK AND LIGHTING FIXTURES SHALL BE POSITIVELY ATTACHED FROM THE STRUCTURE ABOVE.

12 GAUGE GALVANIZED, SOFT-ANNEALED, MILD STEEL HANGER WIRES ARE TO BE ATTACHED TO STRUCTURE ABOVE WITH AN APPROVED CONNECTION DEVICE CAPABLE OF SUPPORTING 100 # MINIMUM.

ALL LIGHTING FIXTURES SHALL BE POSITIVELY ATTACHED TO THE SUSPENDED CEILING SYSTEM BY MECHANICAL MEANS. THE ATTACHMENT DEVICE SHALL HAVE A CAPACITY OF 100 PERCENT OF THE LIGHTING FIXTURE WEIGHT ACTING IN ANY DIRECTION.

SUPPLEMENTAL 12 GAUGE HANGER WIRE SHALL ATTACH THE GRID TO THE STRUCTURE ABOVE WITHIN 6" OF EACH CORNER OF THE LIGHT FIXTURES. TANDEM FIXTURES MAY UTILIZE COMMON WIRES.

LIGHT FIXTURES WEIGHING LESS THAN 56 POUND SHALL HAVE (2) 12-GAUGE WIRES CONNECTED FROM THE FIXTURE HOUSING TO THE STRUCTURE ABOVE. THESE WIRES MAY BE SLACK. LIGHT FIXTURES WEIGHING 56 POUNDS OR MORE SHALL BE INDEPENDENTLY SUPPORTED FROM THE BUILDING STRUCTURE.

RACE AT FLUORESCENT LIGHTS TO BE SUPPORTED AT OPPOSITE CORNERS (2) FROM STRUCTURE ABOVE

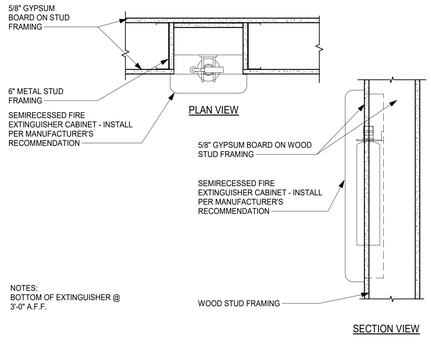
CEILINGS MAY BE SUPPORTED FROM ROOF/FLOOR STRUCTURE. FLOOR DECK, OR ROOF DECK (ROOF DECK IS SUBJECT TO STRUCTURAL GENERAL NOTES).

LOOP VERTICAL HANGER WIRES THROUGH MAIN RUNNERS WITH NOT LESS THAN 3 TIGHT TURNS. LOOP HORIZONTAL RESTRAINT WIRES WITH 4 TIGHT TURNS. MAKE ALL TURNS WITHIN A DISTANCE OF 3".

INSTALLATION OF CEILING SUSPENSION SYSTEM SHALL MEET THE REQUIREMENTS OF THE 2009 IBC AND ASTM C636

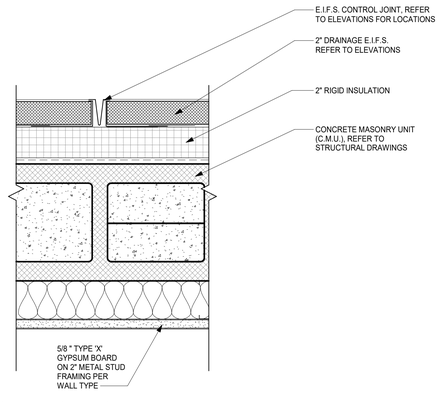
TYPICAL SUSPENDED ACOUSTIC TILE CEILING DETAIL 1

SCALE: 1 1/2" = 1'-0"



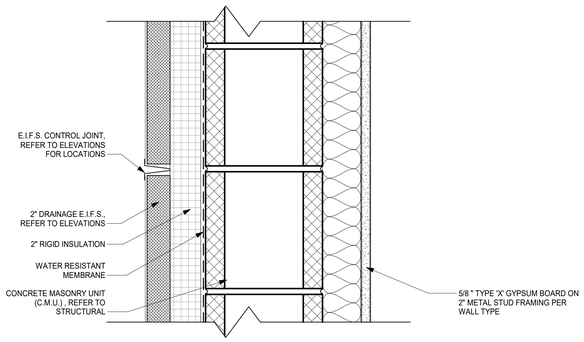
FIRE EXTINGUISHER DETAIL 2

SCALE: 1 1/2" = 1'-0"



EIFS CONTROL JOINT 3

SCALE: 3" = 1'-0"



EIFS CONTROL JOINT 4

SCALE: 3" = 1'-0"

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SHEET CONTENTS:
MISCELLANEOUS DETAILS

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SHEET:
A9.01

GENERAL:

G1 THE NOTES AND SPECIFICATIONS PROVIDED ON THE STRUCTURAL DRAWINGS ARE EXCERPTS FROM THE RELATING PROJECT SPECIFICATIONS. THEY ARE NEITHER COMPLETE NOR DO THEY REPLACE THE CONTRACT SPECIFICATIONS.

G2 CODE: CONSTRUCTION SHALL CONFORM TO THE PROVISIONS OF THE INTERNATIONAL BUILDING CODE OF LATEST ADOPTION AND ALL STANDARDS REFERENCED THEREIN IN THEIR ENTIRETY, WITH ALL LOCALLY ADOPTED AMENDMENTS, REFERENCED THEREIN.

G3 MEANS AND METHODS: THE DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE MEANS AND METHODS OF CONSTRUCTION UNLESS SO STATED OR NOTED. THE CONTRACTOR IS RESPONSIBLE FOR ALL MEANS AND METHODS RELATING TO THE SPECIFIC STRUCTURAL ERECTION ITEMS ADDRESSED IN THE LATEST OSHA REGULATIONS.

G4 GENERAL DETAILS AND NOTES ON THESE SHEETS SHALL APPLY UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE. CONSTRUCTION DETAILS NOT FULLY SHOWN OR NOTED SHALL BE SIMILAR TO DETAILS SHOWN FOR SIMILAR CONDITIONS. ALL WORK OR CONSTRUCTION SHALL COMPLY WITH ALL APPLICABLE BUILDING CODES, REGULATION AND SAFETY REQUIREMENTS.

G5 UNLESS ACCOMPANIED BY A FORMAL CHANGE ORDER, RESPONSES TO QUESTIONS AND RFI'S, COMMENTS MADE DURING THE REVIEW OF SUBMITTALS, AND DIRECTIVES PROVIDED IN ANY FORM, BY THE ENGINEER TO THE CONTRACTOR DURING THE CONSTRUCTION PROCESS ARE INTENDED TO BE CLARIFICATIONS OF THE CONTRACT DOCUMENTS OR CORRECTIONS TO THE PERCEIVED INTERPRETATION OF THE INTENT OF CONTRACT DOCUMENTS BY THE CONTRACTOR. SUCH CLARIFICATIONS AND CORRECTIONS ARE NOT INTENDED TO REPRESENT A CHANGE IN COST OF THE PROJECT TO THE OWNER AND ARE CONSIDERED TO BE INFERABLE FROM THE CONTENT OF THE CONTRACT DRAWINGS OR CONSISTENT WITH INDUSTRY STANDARDS OF CONSTRUCTION. IF THE CONTRACTOR DETERMINES THAT SUCH CLARIFICATIONS AND CORRECTIONS HAVE AN IMPACT ON THE COST OF THE PROJECT TO THE OWNER, THE CONTRACTOR SHALL SUBMIT A CHANGE ORDER REQUEST WITH DETAILED PRICING INFORMATION TO THE ARCHITECT BEFORE PURCHASING, DETAILING, FABRICATING OR INSTALLING ANY COMPONENT RELATED TO SUCH CLARIFICATIONS AND CORRECTIONS.

G6 DISCREPANCIES: THE CONTRACTOR SHALL INFORM THE ENGINEER IN WRITING OF ANY DISCREPANCIES OR OMISSIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS. UPON RECEIPT OF SUCH INFORMATION, THE ENGINEER WILL SEND WRITTEN INSTRUCTIONS TO ALL CONCERNED. ANY SUCH DISCREPANCY, OMISSION, OR VARIATION NOT REPORTED SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND WORK SHALL BE PERFORMED IN A MANNER AS DIRECTED BY THE ENGINEER.

G7 SHORING: IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO DESIGN AND PROVIDE ADEQUATE SHORING, BRACING, AND FORMWORK, AS REQUIRED FOR THE PROTECTION OF LIFE AND PROPERTY DURING THE CONSTRUCTION OF THIS BUILDING. EXCESS LOAD CAPACITY OF SLAB SHALL NOT EXCEED LOADS EQUIVALENT TO THE DESIGN SUPERIMPOSED LOADS LESS CONSTRUCTION DEAD AND LIVE LOADS. DESIGN SUPERIMPOSED LOADS INCLUDE LIVE LOAD, PARTITION LOAD, AND ANY OTHER LOAD NOT IN PLACE AT THE TIME OF SHORING. FLOORS ARE NOT DESIGNED TO SUPPORT FORMWORK AND WET CONCRETE WEIGHT OF NEXT LEVEL. CONTRACTOR SHALL DESIGN AND PROVIDE RE-SHORING TO PREVENT OVERSTRESSING THE STRUCTURE.

G8 EXCAVATION: THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL EXCAVATION PROCEDURES INCLUDING LAGGING, SHORING, AND PROTECTION OF ADJACENT PROPERTY, STRUCTURES, STREETS AND UTILITIES IN ACCORDANCE WITH THE LOCAL BUILDING DEPARTMENT.

G9 OTHER TRADES: IT IS NOT THE INTENT THAT THE STRUCTURAL DRAWINGS BE VIEWED AS STAND ALONE DRAWINGS WITH RESPECT TO PROJECT DIMENSIONS OR ANY OTHER COMPONENT OF THE CONSTRUCTION THAT CAN AND MAY BE IDENTIFIED IN OTHER PARTS OF THE CONTRACT DOCUMENTS. IT REQUIRES THE ENTIRE SET OF CONTRACT DOCUMENTS TO PROPERLY CONSTRUCT THE STRUCTURE AS WELL AS OTHER COMPONENTS OF THE BUILDING. ANCHORS REQUIRED FOR ANCHORING MEP EQUIPMENT AND / OR PIPING ARE NOT SHOWN ON THESE DRAWINGS. THE CONTRACTOR SHALL DETERMINE AND COORDINATE REQUIREMENTS FROM OTHER DISCIPLINES AND SHALL PROVIDE APPROPRIATE ALLOWANCES INTO THE BID. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ASSEMBLE AND COORDINATE THE REQUIREMENTS OF ALL COMPONENTS OF THE CONTRACT DOCUMENTS IN ORDER TO PROPERLY IMPLEMENT THE REQUIREMENTS OF THE CONTRACT. SEE ARCHITECTURAL, ELECTRICAL, AND MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF PIPES, VENTS, CHASES, DUCTS AND OTHER OPENINGS AND DETAILS NOT SHOWN ON THESE STRUCTURAL DRAWINGS. ALL DIMENSIONS ARE TO BE CHECKED AND VERIFIED WITH THE ARCHITECTURAL DRAWINGS.

G10 BRACING: THESE DRAWINGS ILLUSTRATE THE PRIMARY STRUCTURAL FRAME IN ITS COMPLETED FORM. TEMPORARY BRACING, PROPERLY DESIGNED UNDER THE SUPERVISION OF A LICENSED STRUCTURAL ENGINEER, SHALL BE PROVIDED AS REQUIRED TO HOLD ALL COMPONENTS OF THE STRUCTURE IN PLACE UNTIL FINAL SUPPORT IS SECURELY ANCHORED.

G11 INSPECTIONS: ANY INSPECTIONS, SPECIAL OR OTHERWISE, THAT ARE REQUIRED BY THE BUILDING CODES, LOCAL BUILDING DEPARTMENTS, OR THESE PLANS, SHALL BE DONE BY AN INDEPENDENT INSPECTION COMPANY. JOB SITE VISITS BY THE ENGINEER DO NOT CONSTITUTE, OR SUBSTITUTE, INSPECTIONS UNLESS SPECIFICALLY CONTRACTED FOR.

G12 THE LOCATION AND DIMENSIONS OF ALL OPENINGS, DEPRESSIONS, RECESSES, SLOPES, BLOCKOUTS, CURBS, AND EMBEDMENTS SHOWN IN THE STRUCTURE WHICH ARE RELATED TO PURPOSES DEPICTED IN CONTRACT DOCUMENTS OTHER THAN THE STRUCTURAL DRAWINGS OR BY MANUFACTURERS AND INSTALLERS OF VARIOUS EQUIPMENT AND FINISHES SHALL BE VERIFIED BY THE CONTRACTOR TO BE SUITABLE FOR THE PURPOSES DEPICTED BY THE CONTRACT DOCUMENTS REQUIRING SUCH ITEMS OR TO BE SUITABLE FOR THE INSTALLATION OF VARIOUS EQUIPMENT AND FINISHES. ANY REQUIREMENT FOR RELOCATION OR CHANGE IN DIMENSIONS OF ANY OPENING, DEPRESSION, RECESS, SLOPE, BLOCKOUT, OR EMBEDMENT SHALL BE SUBMITTED TO THE ARCHITECT AND ENGINEER IN DRAWING FORM PRIOR TO THE FABRICATION OF MATERIALS OR CONSTRUCTION.

G13 VARIOUS OPENINGS, DEPRESSIONS, RECESSES, SLOPES, BLOCKOUTS, CURBS, AND EMBEDMENTS NOT SHOWN IN THE STRUCTURAL DRAWINGS MAY BE REQUIRED IN THE STRUCTURE FOR PURPOSES DEPICTED IN CONTRACT DOCUMENTS OTHER THAN THE STRUCTURAL DRAWINGS OR BY THE MANUFACTURERS AND INSTALLERS OF VARIOUS EQUIPMENT AND FINISHES. THE CONTRACTOR SHALL INCORPORATE AND COORDINATE THE LOCATION AND DIMENSIONS OF ANY OPENING, DEPRESSION, RECESS, SLOPE, BLOCKOUT, OR EMBEDMENT INTO THE STRUCTURE AS REQUIRED TO BE SUITABLE FOR THE PURPOSES DEPICTED BY THE CONTRACT DOCUMENTS REQUIRING SUCH ITEMS OR TO BE SUITABLE FOR THE INSTALLATION OF VARIOUS EQUIPMENT AND FINISHES. THE SUITABLE LOCATION AND DIMENSIONS OF ALL OPENINGS, DEPRESSIONS, RECESSES, SLOPES, BLOCKOUTS, AND EMBEDMENTS SHALL BE SUBMITTED TO THE ARCHITECT AND ENGINEER IN DRAWING FORM PRIOR TO THE FABRICATION OF MATERIALS OR CONSTRUCTION. AN ALLOWANCE SHALL BE INCLUDED IN THE BID PRICE SUFFICIENT TO ADEQUATELY COVER STRUCTURAL REQUIREMENTS FOR SUCH ITEMS WITHOUT NEED FOR A FUTURE CHANGE TO THE BID PRICE.

G14 LOADINGS FOR MECHANICAL EQUIPMENT: ARE BASED ON THE UNITS SHOWN ON THE MECHANICAL DRAWINGS AND IN THE EQUIPMENT SCHEDULE. ANY CHANGES IN TYPE, SIZE, WEIGHT, OR NUMBER OF PIECES OF EQUIPMENT SHALL BE REPORTED TO THE ARCHITECT FOR VERIFICATION OF THE ADEQUACY OF SUPPORTING MEMBERS PRIOR TO THE PLACEMENT OF SUCH EQUIPMENT.

G15 SUBSTITUTIONS & DEVIATIONS: PROPOSED SUBSTITUTION OF MATERIALS, PRODUCTS OR DETAILS DEPICTED IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED ONLY DURING THE BIDDING PERIOD. AFTER BIDS ARE ACCEPTED, NOTICE IN WRITING OF ANY PROPOSED SUBSTITUTIONS OR ANY PROPOSED DEVIATIONS TO THE STRUCTURE AS REQUIRED BY THESE DOCUMENTS SHALL BE SUBMITTED WITH BACKUP DATA IDENTIFYING THE REASON FOR THE PROPOSED SUBSTITUTION OR DEVIATION. FOR PROPOSED SUBSTITUTIONS OF PRODUCTS, THE BACKUP DATA SHALL INCLUDE CURRENT I.C.B.O. REPORT. THE PROPOSED SUBSTITUTIONS SHALL BE CONSIDERED AFTER ACCEPTANCE OF BIDS, ONLY WHEN THEY ARE SUBMITTED WITH DOCUMENTED SAVINGS TO BE DEDUCTED FROM THE PROJECT CONTRACT AMOUNT. MATERIALS OR PRODUCTS THAT DO NOT HAVE AN I.C.B.O. REPORT, WILL NOT BE CONSIDERED FOR SUBSTITUTIONS.

G16 SEE ARCHITECTURAL DRAWINGS FOR ELEVATIONS NOT SHOWN AND FOR EXACT LOCATIONS OF ALL SLAB DEPRESSIONS. THE CONTRACTOR SHALL COMPARE THE STRUCTURAL SECTIONS WITH THE ARCHITECTURAL SECTIONS AND REPORT ANY DISCREPANCY TO THE ARCHITECT PRIOR TO FABRICATING OR INSTALLING STRUCTURAL MEMBERS.

G17 THE CONTRACTOR SHALL ENSURE THAT CONSTRUCTION MATERIALS WHOSE WEIGHT EXCEEDS THE DESIGN LIVE LOADS INDICATED ON THE STRUCTURAL DRAWINGS ARE NOT STORED ON STRUCTURALLY SUPPORTED FLOOR OR ROOF FRAMING.

G18 IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE GRADES WITH THE CIVIL ENGINEER'S GRADING PLAN AND THE LANDSCAPE ARCHITECT'S PLAN.

G19 THE DRAWINGS IN THE STRUCTURAL DOCUMENTS ARE NOT TO BE SCALED FOR ANY PURPOSE, INCLUDING THE DETERMINATION OF QUANTITIES AND THE FIT UP OF MATERIALS.

G20 THESE PLANS MUST BE SUBMITTED FOR REVIEW BY THE GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION.

G21 IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN ALL CONTRACT DOCUMENTS AND LATEST ADDENDA AND TO SUBMIT SUCH DOCUMENTS TO ALL SUBCONTRACTORS AND MATERIAL SUPPLIERS PRIOR TO THE SUBMITTAL OF SHOP DRAWINGS, FABRICATION OF ANY STRUCTURAL MEMBERS, AND ERECTION IN THE FIELD.

G22 PRECONSTRUCTION MEETINGS : THE CONTRACTOR IS RESPONSIBLE FOR ARRANGING PRECONSTRUCTION MEETINGS FOR THE FOUNDATION AND SUPERSTRUCTURE ELEMENTS OF THE PRIMARY FRAME WITH A MINIMUM OF TWO WEEKS OF NOTICE PRIOR TO START OF THE RELEVANT WORK. ATTENDEES SHALL INCLUDE THE CONTRACTORS, APPROPRIATE SUBCONTRACTORS, FABRICATORS, INSPECTORS, ARCHITECT/ENGINEERS. ON THE MEETING AGENDA SHALL BE REVIEW OF WORK SCOPE, PROJECT SCHEDULE OF THE ELEMENT IN QUESTION, CONTACT INFORMATION OF RESPONSIBLE PARTIES, INSPECTION POINTS, REVIEW OF MATERIALS AND ANY SPECIAL DESIGN ISSUES, CLARIFICATIONS, TESTING AND ACCEPTANCE, AND ANY OTHER TOPIC DEEMED APPROPRIATE BY THE CONTRACTOR OR THE ARCHITECT.

G23 EXISTING UTILITIES : UNLESS SPECIFICALLY SHOWN ON THE STRUCTURAL PLANS, THE LOCATION OF ANY EXISTING SUBGRADE UTILITIES IS UNKNOWN. FOUNDATION CONSTRUCTION MAY HAVE TO BE MODIFIED UPON DISCOVERY OF SUCH ITEMS. NOTIFY ARCHITECT AND ENGINEER OF ANY CONFLICT OF EXISTING UTILITY ITEMS WITH THE CONSTRUCTION OF FOUNDATION ELEMENTS.

G24 ROOF DRAINAGE : THE ROOF STRUCTURE AND IT'S SUPPORTING ELEMENTS HAVE BEEN DESIGNED WITH THE ASSUMPTION THAT SUFFICIENT DRAINAGE HAS BEEN PROVIDED TO PREVENT ANY PONDING OF WATER.

SUBGRADE PREPARATION:

SP1 THE CONTRACTOR MUST READ THE GEOTECHNICAL REPORT AND BE THOROUGHLY FAMILIAR WITH SITE AND SUB GRADE INFORMATION GIVEN THEREIN. ALL SUB GRADE PREPARATION, FILL, FILL PLACEMENT, AND FOUNDATION CONSTRUCTION SHALL BE PERFORMED IN STRICT COMPLIANCE WITH THE STRUCTURAL DOCUMENTS AND THE SOILS REPORT, AND SHALL BE OBSERVED, TESTED, AND APPROVED BY A QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO PROCEEDING WITH FOUNDATION CONSTRUCTION.

SP2 ALL ORGANIC AND DELETERIOUS MATERIAL AND ALL EXPANSIVE CLAYS, AS WELL AS ANY EXISTING PAVING, FOUNDATIONS, OR EXISTING FILL SHALL BE REMOVED FROM THE BUILDING PAD AREA PRIOR TO PLACEMENT OF FILL.

SP3 GEOTECHNICAL REPORT FOR THIS PROJECT IS BALCONES GEOTECHNICAL REPORT PROJECT NUMBER 0118-073, DATED FEBRUARY 12, 2019, AND SUPPLEMENTARY ADDENDUM #1 DATED MARCH 26, 2019.

FOUNDATIONS:

FD1 GRADE BEAM DIMENSIONS AND/OR LOCATIONS MAY NOT BE ALTERED WITHOUT APPROVAL OF THE ENGINEER OF RECORD. SIDES OF GRADE BEAMS SHALL BE FORMED. EARTH FORMING OF GRADE BEAMS IS NOT ALLOWED.

FD2 REFER TO THE SLAB CONSTRUCTION NOTES FOR ALL SLAB-ON-GRADE REQUIREMENTS.

FD3 REFERENCE THE FOUNDATION PLAN FOR SIZE AND SPACING OF SLAB-ON-GRADE REINFORCEMENT.

FD4 PROVIDE CORNER BARS AT ALL CORNERS AND INTERSECTIONS UNLESS NOTED OTHERWISE. REFER TO TYPICAL CORNER BAR DETAIL.

FD5 FOUNDATION WALLS SHALL HAVE TEMPORARY BRACING BEFORE BACKFILL IS PLACED AGAINST THEM. TEMPORARY BRACING SHALL NOT BE REMOVED UNTIL WALL IS PERMANENTLY BRACED BY FLOOR DIAPHRAGMS, UNLESS NOTED OTHERWISE.

FD6 FOUNDATION PENETRATIONS SHALL BE SUBJECT TO APPROVAL BY THE ARCHITECT/ENGINEER.

FD7 CONSTRUCTION JOINTS: CAST ALL PILASTERS ON BEAMS AND WALLS MONOLITHICALLY WITH THE BEAM OR WALL. CAST ALL INTERSECTIONS OF THE VARIOUS CONCRETE ELEMENTS (SLABS, JOISTS, BEAMS, WALLS, COLUMNS, AND PILASTERS) MONOLITHICALLY UNLESS POCKETS, BLOCKOUTS, OR KEYWAYS ARE SPECIFICALLY DETAILED IN THE DRAWINGS. IF CONSTRUCTION JOINTS ARE ABSOLUTELY UNAVOIDABLE, THE JOINTS SHALL BE LOCATED AS FOLLOWS: VERTICAL CONSTRUCTION JOINTS IN BEAMS, JOISTS, WALLS AND STRUCTURAL SLABS SHALL BE LOCATED WITHIN THE MIDDLE THIRD OF THE SPAN BETWEEN SUPPORTS. CONTRACTOR SHALL SUBMIT CONSTRUCTION JOINT LAYOUT PLANS TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. LOCATE HORIZONTAL JOINTS IN WALL AND COLUMNS AT UNDERSIDE OF SUPPORTED ELEMENTS AT THE TOP OF THE WALL OR COLUMN AND AT THE TOP OF FOOTING OR FLOOR SLAB AT THE BOTTOM OF THE WALL OR COLUMN.

FD8 WATERSTOPS: PROVIDE WATERSTOPS AT ALL SUB GRADE CONSTRUCTION JOINTS IN CONCRETE ELEMENTS WHERE THE EARTH SUB GRADE AT THE JOINT IS ON ONE SIDE OF THE CONCRETE MEMBER ONLY. PROVIDE WATERSTOPS AT OTHER LOCATIONS INDICATED IN THE DOCUMENTS.

FD9 VARIOUS CONDUITS, PIPES AND SLEEVES WHICH ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS MAY BE REQUIRED BY EQUIPMENT SUPPLIERS OR THE ARCHITECTURAL, MECHANICAL, ELECTRICAL AND PLUMBING DRAWINGS. THE CONTRACTOR SHALL COORDINATE AND IMPLEMENT THESE ITEMS INTO THE CONCRETE WORK. ALL CONDUITS, PIPES AND SLEEVES EMBEDDED IN CONCRETE SHALL COMPLY WITH ACI 318, SECTIONS 20.7, 26.5.2.1 (e) & 26.8 AND GENERAL NOTE CIP5.

FD10 NO VERTICAL CONDUIT, SLEEVE OR PIPE IS PERMITTED TO BE EMBEDDED IN THE CONCRETE BEAM WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER OR UNLESS SPECIFICALLY DETAILED OTHERWISE.

FD11 REFER TO THE GEOTECHNICAL REPORT FOR RISK OF GROUNDWATER PRESENCE AND ITS POTENTIAL IMPACT ON NEW CONSTRUCTION. CONTRACTOR MUST CARRY AN APPROPRIATE ALLOWANCE IN THE BIDS FOR MEASURES SUCH AS SITE DEWATERING AND PIER CASINGS ETC.

CONCRETE MIX:

CM1 CONCRETE SPECIFICATIONS SHALL BE AS FOLLOWS:

CONCRETE MIX DESIGN SCHEDULE

USE	28 DAY STRENGTH (PSI)	SLUMP (IN)	MAX. WATER CEMENT RATIO	MAX. CURED DENSITY (PCF)	MAX. AGGREGATE SIZE (IN)	CEMENT TYPE	MAX ALLOWABLE % FLY ASH (SEE CM5)	% AIR ENTRAINMENT
FOOTINGS	4,000	3 - 5	0.50	150	1"	I/II	30	-
SLABS	4,000	3 - 5	0.50	150	1"	I/II	20	-
WALLS	3,000	6 - 8	0.50	150	1"	I/II	30	-
SLAB FOR EQUIPMENT PADS	3,000	3 - 5	0.45	150	1"	I/II	20	5 - 7 IF EXPOSED TO WEATHER

CM2 CHANGING MATERIAL PROPORTIONS, PROPERTIES, SOURCES, COMBINATIONS, ADDITIONS OR ANYTHING WHICH IS A CHANGE IN THE APPROVED MIX DESIGN REQUIRES A NEW MIX DESIGN SUBMITTAL.

CM3 CONCRETE SLUMPS INDICATED ABOVE ARE AFTER THE ADDITION OF WATER-REDUCING ADMIXTURES OR PLASTICIZERS. SLUMP AT THE POINT OF PLACEMENT SHALL NOT EXCEED AMOUNT SPECIFIED. DO NOT PLACE CONCRETE WITH SLUMP AND TEMPERATURE OUTSIDE THE LIMITS PROVIDED ON THE APPROVED MIX DESIGNS. USE OF CHLORIDES IN ANY ADMIXTURE IS NOT PERMITTED.

CM4 PORTLAND CEMENT SHALL CONFORM TO ASTM C150, OF TYPES NOTED IN THE SCHEDULE(MASS CONCRETE SHALL ONLY BE TYPE II CEMENT). NORMAL WEIGHT AGGREGATE SHALL CONFORM TO ASTM C33. LIGHT WEIGHT AGGREGATE SHALL CONFORM TO ASTM C330. ALL AGGREGATE SHALL BE FROM A SINGLE SOURCE.

CM5 FLY ASH SHALL NOT BE USED AS A CONSTITUENT IN ARCHITECTURALLY EXPOSED CONCRETE. FLY ASH IS ALLOWED IN ALL OTHER NON-ARCHITECTURALLY EXPOSED CONCRETE, UP TO THE MAXIMUM PERCENTAGE LISTED ABOVE. THE WEIGHT OF THE FLY ASH SHALL BE ADDED TO THE WEIGHT OF THE CEMENT IN THE CALCULATION OF THE WATER CEMENT RATIO. THE CONTRACTOR SHALL CONFIRM IN THE MIX DESIGN SUBMITTAL, THAT THE USE OF FLY ASH WILL NOT INTERFERE WITH THE PERFORMANCE OF OTHER PRODUCTS AND MATERIALS THAT WILL BE IN CONTACT WITH THE CONCRETE.

CM6 AIR ENTRAINMENT IS REQUIRED ONLY IN HARD ROCK CONCRETE PERMANENTLY EXPOSED TO WEATHER CONDITIONS. WHERE LIGHTWEIGHT CONCRETE IS SPECIFIED, AIR ENTRAINMENT IS REQUIRED FOR ALL EXPOSURE CONDITIONS. PERCENT AIR ENTRAINMENT LISTED IS PLUS/MINUS 1.5 %. DO NOT AIR-ENTRAIN INTERIOR FLOOR SLABS THAT RECEIVE HARD TROWEL FINISH.

CM7 MIX FOR TOPPING SLABS THAT ARE LESS THAN TWO INCHES THICK SHALL CONTAIN "FIBERMESH" POLYPROPYLENE, MD GRADED FIBERS WITH A MINIMUM RATIO OF 1.5 POUNDS PER CUBIC YARDS. ALSO REFER TO NOTES SECTIONS ON NON-METALLIC REINFORCEMENT AND NON COMPOSITE TOPPING SLABS.

CM8 SHRINKAGE LIMIT FOR CONCRETE USED IN ELEVATED SLABS AND BEAMS SHALL BE 0.045% AT 28 DAYS MEASURED IN ACCORDANCE WITH ASTM C157. SUBMIT LABORATORY TEST RESULTS TO THE ENGINEER PRIOR TO CONSTRUCTION.

CM9 NON CHLORIDE ACCELERATING ADMIXTURE MAY BE USED IN CONCRETE SLABS PLACED AT AMBIENT TEMPERATURES BELOW 50 DEGREES FAHRENHEIT AT CONTRACTOR'S OPTION.

CM10 THE COMPRESSIVE STRENGTH OF GROUT BELOW BASE PLATES SHALL BE AT LEAST 7500 PSI.

CM11 TESTING ACCEPTANCE CRITERIA FOR CAST IN PLACE CONCRETE IS IN THE SPECIFICATIONS.

CM12 DO NOT PLACE CONCRETE WITH SLUMP AND TEMPERATURE OUTSIDE THE LIMITS PROVIDED ON THE APPROVED MIX DESIGNS.

CM13 CONTRACTOR MUST SUBMIT THE MIX DESIGN SUBMITTALS TO THE PROJECT'S TESTING LABORATORY PRIOR TO SUBMITTING TO THE ARCHITECT AND/OR STRUCTURAL ENGINEER. A SUBMITTAL WITHOUT TESTING LABORATORY'S APPROVAL WILL BE REJECTED.

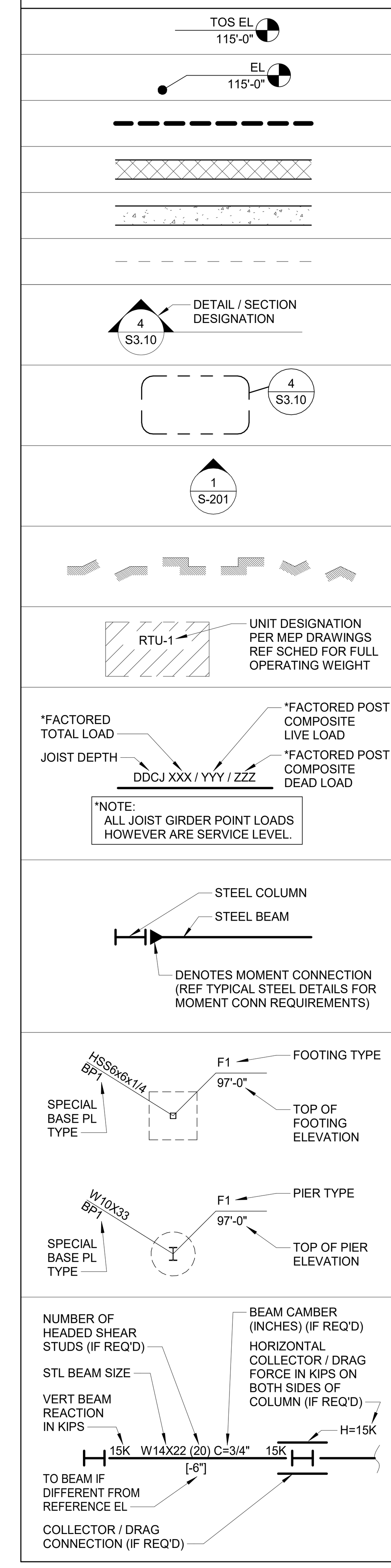
4 GENERAL NOTES
12" = 1'-0"

ABBREVIATION LEGEND

ABBR	DEFINITION	ABBR	DEFINITION
AB	ANCHOR BOLT	LONG	LONGITUDINAL
ACI	AMERICAN CONCRETE INSTITUTE	LSH	LONG SIDE HORIZONTAL
AFF	ABOVE FINISHED FLOOR	LSV	LONG SIDE VERTICAL
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION	LWC	LIGHT WEIGHT CONCRETE
AISI	AMERICAN IRON AND STEEL INSTITUTE	MAX	MAXIMUM
ARCH	ARCHITECTURAL	MC	MOMENT CONNECTION
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS	MECH	MECHANICAL
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	MFR	MANUFACTURER
AWS	AMERICAN WELDING SOCIETY	MIN	MINIMUM
BFF	BELOW FINISHED FLOOR	MISC	MISCELLANEOUS
BL	BLOCK LINTEL	MO	MASONRY OPENING
BO	BOTTOM OF	MTL	METAL
BOS	BOTTOM OF STEEL	NIC	NOT IN CONTRACT
BOT	BOTTOM	NO	NUMBER
BP	BASE PLATE	NS	NEAR SIDE
BRG	BEARING	NTS	NOT TO SCALE
BTWN	BETWEEN	NWC	NORMAL WEIGHT CONCRETE (150 PCF)
CGS	CENTROID OF TENDONS	OC	ON CENTER
CIP	CAST IN PLACE	OD	OUTSIDE DIAMETER
CJ	CONSTRUCTION JOINT	OH	OPPOSITE HAND
CL	CENTER LINE	PAF	POWDER ACTUATED FASTENER
CJP	COMPLETE JOINT PENETRATION	PCF	POUNDS PER CUBIC FOOT
CLR	CLEAR	PCI	PRECAST AND PRESTRESSED CONCRETE INSTITUTE
CMU	CONCRETE MASONRY UNIT	PT	POST-TENSIONING INSTITUTE
COL	COLUMN	PE	PROFESSIONAL ENGINEER
CONN	CONNECTION	PEMB	PRE-ENGINEERED METAL BUILDING
CONC	CONCRETE	PENTR	PENETRATION
CONST	CONSTRUCTION	PL	PLATE
CONT	CONTINUOUS	PLAM	PLASTIC LAMINATE
CRSI	CONCRETE REINFORCING STEEL INSTITUTE	PLF	POUNDS PER LINEAR FOOT
DIA	DIAMETER	PP	PARTIAL PENETRATION
DBA	DOWEL BAR ANCHOR	PSF	POUNDS PER SQUARE FOOT
DL	DEAD LOADS	PSI	POUNDS PER SQUARE INCH
EA	EACH	PT	POST-TENSIONING
EDC	ELECTRICAL DISTRIBUTION CENTER	QTY	QUANTITY
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM	RAF	RAISED ACCESS FLOOR
EJ	EXPANSION JOINT	REF	REFER TO
EL	ELEVATION	REINF	REINFORCING
ELEC	ELECTRICAL	REQD	REQUIRED
EQ	EQUAL	REV	REVERSE
EQUIV	EQUIVALENT	RO	ROUGH OPENING
EW	EACH WAY	RTU	ROOF TOP UNIT
EXIST	EXISTING	SCHED	SCHEDULE
EXP	EXPANSION	SE	STRUCTURAL ENGINEER
EXT	EXTERIOR	SHT	SHEET
FDN	FOUNDATION	SIM	SIMILAR
FF	FINISHED FLOOR	SJI	STEEL JOIST INSTITUTE
FM	FACTORY MUTUAL	SOG	SLAB ON GRADE
FRP	FIBER REINFORCED PLASTIC	SPECS	SPECIFICATIONS
FS	FAR SIDE	STAG	STAGGERED
FTG	FOOTING	STIFF	STIFFENER
FV	FIELD VERIFY	STL	STEEL
GA	GAUGE	STRUC	STRUCTURAL
GALV	GALVANIZED	T&B	TOP AND BOTTOM
GC	GENERAL CONTRACTOR	TB	TOP OF BEAM
GYP BD	GYPSUM BOARD	TC	TRANSFER COLUMN
H	HEIGHT	THK	THICKNESS
HORIZ	HORIZONTAL	TO	TOP OF
HSA	HEADED STUD ANCHOR	TOC	TOP OF CONCRETE
IBC	INTERNATIONAL BUILDING CODE	TOF	TOP OF FOOTING
INFO	INFORMATION	TOGB	TOP OF GRADE BEAM
INT	INTERIOR	TOM	TOP OF MASONRY
ISO	ISOLATION	TOP	TOP OF PAVING
JBE	JOIST BEARING ELEVATION	TOS	TOP OF STEEL
JST	JOIST	TOSC	TOP OF STRUCTURAL CONCRETE
JT	JOINT	TOW	TOP OF WALL
KIP	1000 POUNDS	TRANS	TRANSVERSE
KSI	KIPS PER SQUARE INCH	T&S	TEMPERATURE AND SHRINKAGE
L	LENGTH	TYP	TYPICAL
Ld	TENSION DEVELOPMENT LENGTH AS SHOWN IN REINFORCING LAP SCHEDULE	UL	UNDERWRITERS LABORATORIES
LB	POUNDS	UNO	UNLESS NOTED OTHERWISE
LL	LIVE LOAD	VERT	VERTICAL
LLH	LONG LEG HORIZONTAL	W	WIDTH
LLV	LONG LEG VERTICAL	WP	WORK POINT
LOC	LOCATION	WWF	WELDED WIRE FABRIC

3 ABBREVIATION LEGEND
12" = 1'-0"

SYMBOLS LEGEND



LEVEL ELEVATION
SPOT ELEVATION
VERTICAL BRACE
LOAD BEARING CMU WALL AND/OR SHEARWALL
LOAD BEARING CONC WALL AND/OR SHEARWALL
MATCHLINE
DETAIL / SECTION REFERENCE CUT
PARTIAL PLAN OR PLAN DETAIL REFERENCE
VERTICAL BRACE, SHEARWALL OR TRUSS ELEVATION REFERENCE
SLOPE IN STRUCTURE, DROP IN STRUCTURE, RIDGES AND VALLEYS
MEP EQUIPMENT
COMPOSITE JOIST (CJ) KEY
MOMENT CONNECTION
COLUMN, BASE PLATE AND FOUNDATION MARK
STEEL BEAM KEY

2 SYMBOLS LEGEND
1/8" = 1'-0"

SHEET LIST

SHEET NUMBER	SHEET NAME
S0.00	GENERAL NOTES
S0.01	GENERAL NOTES
S0.02	GENERAL NOTES
S0.02A	GENERAL NOTES ALTERNATE 1
S0.03	OVERALL 3D VIEW
S0.03A	OVERALL 3D VIEW ALTERNATE 1
S1.10	FOUNDATION PLAN AND ROOF PLAN
S1.10A	FOUNDATION PLAN AND ROOF PLAN ALTERNATE 1
S3.01	STRUCTURAL CONCRETE DETAILS
S4.01	TYPICAL CMU DETAILS AND SCHEDULES
S5.01	TYPICAL CONNECTION DETAILS
S5.02	STEEL ROOF FRAMING SECTIONS AND DETAILS

1 SHEET LIST
12" = 1'-0"

STATE OF TEXAS
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WILLIAMSON COUNTY - I.T. SERVER BLDG
SHEET CONTENTS:
GENERAL NOTES

DATE:
05/23/2019
JOB NO.:
18465.01
SHEET:
S0.00

CONCRETE REINFORCING:

CR1 REINFORCING STEEL SHALL CONFORM TO ASTM A615. BARS SHALL BE NEW OR RECYCLED DOMESTIC BILLET STEEL OF A DOMESTIC MANUFACTURE. GRADES 60

CR2 REINFORCING STEEL THAT REQUIRES WELDING SHALL CONFORM TO ASTM A706, WITH GRADES AS SHOWN ABOVE.

CR3 REINFORCEMENT NOT SPECIFICALLY CALLED OUT IN SECTIONS OR GENERAL NOTES SHALL BE PROVIDED AS PER THE PIER, BEAM, COLUMN, SLAB AND WALL SCHEDULES.

CR4 DOWELS FROM HARDENED CONCRETE INTO FRESH CONCRETE SHALL BE PROVIDED AS PER THE DOWEL SCHEDULE.

CR5 REFER TO ACI 315 FOR DETAILING PRACTICES, FABRICATION, AND BAR SUPPORTS AND SPACERS.

CR6 IN GENERAL, CLEAR CONCRETE COVER MEASURED TO THE OUTERMOST BAR, STIRRUP OR TIE SHALL BE AS FOLLOWS:

EXPOSURE CONDITION	BAR SIZE OR USE	MINIMUM COVER	TOLERANCE
CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH (WITH OR WITHOUT VAPOR RETARDER):	ALL	3"	3/8"
EXPOSED TO EARTH OR WEATHER	#5 BAR AND SMALLER	1 1/2"	3/8"
	#6 BAR AND LARGER	2"	1/2"
NOT EXPOSED TO WEATHER OR IN CONTACT WITH THE GROUND: (TYPICAL INTERIOR CONDITIONS, CRAWL SPACES, AND UNDERSIDE OF PARKING FLOORS ARE IN THIS CATEGORY)	SLABS AND WALLS	1"	3/8"
	WIDE PAN OR SKIP JOISTS AND BEAMS	1 1/2"	1/2"
	COLUMNS	1 5/8"	1/2"

EXPOSURE CONDITION	BAR SIZE OR USE	MINIMUM COVER	TOLERANCE

CR7 UNLESS BARS ARE SPECIFICALLY SHOWN IN THE BAR BENDING DIAGRAMS ON THE SCHEDULES, PROVIDE BARS AS FOLLOWS:
- A. PROVIDE STANDARD 90 DEGREE HOOK ON TOP BARS AT DISCONTINUOUS ENDS AND CANTILEVER ENDS.
- B. SPLICE BOTTOM BARS DIRECTLY OVER MEMBER SUPPORTS, UNLESS NOTED OTHERWISE.
- C. SPLICE TOP BARS AT THE CENTER LINE BETWEEN MEMBER SUPPORTS, UNLESS NOTED OTHERWISE.
- D. SPLICE INTERMEDIATE BARS ALTERNATELY BETWEEN MEMBER SUPPORTS AND THE CENTER LINES BETWEEN MEMBER SUPPORTS, UNLESS NOTED OTHERWISE.
- E. SPLICE VERTICAL BARS IN WALLS ONLY AT FLOOR LINES, UNLESS NOTED OTHERWISE. HORIZONTAL BARS SHALL BE SPLICED AS SPECIFIED FOR TOP, BOTTOM, AND INTERMEDIATE BARS OF BEAMS.
- F. CENTER BARS NOTED AS "AT SUPT'S." OVER MEMBER SUPPORTS, AND CENTER BARS NOTES AS "BTWN. SUPT'S," BETWEEN SUPPORTS.
- G. PLACE BARS NOTED AS "2ND LAYER" BELOW THE PRIMARY TOP BARS (OR ABOVE THE PRIMARY BOTTOM BARS) AND PROVIDE #11 SPACER BARS PLACED AT INTERVALS OF 4'-0" BETWEEN THE TWO LAYERS OF BARS.
- H. SPLICE VERTICAL BARS IN COLUMNS ONLY AT FLOOR LINES, UNLESS NOTED OTHERWISE. COLUMN BAR SPLICES SHALL BE AS SHOWN IN THE COLUMN SCHEDULE.
- I. PROVIDE CORNER BARS FOR EACH HORIZONTAL BAR AT THE INSIDE AND OUTSIDE FACES OF INTERSECTING BEAMS OR WALLS. REFER TO CORNER BAR DETAILS ON SHEET S-302.
- J. REFER TO THE COLUMN REINFORCING DIAGRAMS FOR ADDITIONAL TIES ABOVE AND BELOW THE FLOOR FRAMING MEMBERS.

CR8 BARS SHOWN IN THE SCHEDULE TO HOOK AT DISCONTINUOUS ENDS SHALL HAVE THE HOOK PLACED HORIZONTALLY AT EXTERIOR CORNERS.

CR9 PROVIDE NO, 3 DOWELS X 2'-0" AT 1'-6" ON CENTER, WITH A 90 DEGREE HOOK AT ALL EDGES OF CONCRETE SLABS, UNLESS DETAILED OTHERWISE.

CR10 PROVIDE FOUNDATION DOWELS TO MATCH MASONRY WALL REINFORCEMENT. DOWELS SHALL EXTEND INTO THE CONCRETE AND CMU PER THE LAP SCHEDULES.

EMBEDDED SHEAR-STUD CONNECTORS:

SC1 SHEAR-STUD CONNECTIONS SHALL BE NELSON FLUXED SHEAR CONNECTORS (SC) OR APPROVED EQUAL. STUDS SHALL BE AUTOMATICALLY END WELDED IN THE SHOP OR IN THE FIELD. ALL STUD WELDS SHALL BE MANUFACTURED IN ACCORDANCE WITH RECOMMENDATIONS OF THE NELSON STUD WELDING DIVISION, LORAIN, OHIO. SHEAR-STUDS SHALL BE MANUFACTURED OF C1015, C1017, OR C1020 COLD DRAWN STEEL CONFORMING TO ASTM A108.

POST-INSTALLED CONCRETE ANCHORS:

PA1 POST-INSTALLED ANCHORS SHALL ONLY BE USED WHERE SPECIFIED ON THE CONSTRUCTION DOCUMENTS. THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE ENGINEER-OF-RECORD PRIOR TO INSTALLING POST-INSTALLED ANCHORS IN PLACE OF MISSING OR MISPLACED CAST-IN-PLACE ANCHORS. CARE SHALL BE TAKEN IN PLACING POST-INSTALLED ANCHORS TO AVOID CONFLICTS WITH EXISTING REBAR. HOLES SHALL BE DRILLED AND CLEANED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS. SUBSTITUTION REQUESTS FOR PRODUCTS OTHER THAN THOSE SPECIFIED BELOW, SHALL BE SUBMITTED BY THE CONTRACTOR TO THE ENGINEER-OF-RECORD ALONG WITH CALCULATIONS THAT ARE PREPARED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER. THE CALCULATIONS SHALL DEMONSTRATE THAT THE SUBSTITUTED PRODUCT IS CAPABLE OF ACHIEVING THE PERTINENT EQUIVALENT PERFORMANCE VALUES (MINIMUM) OF THE SPECIFIED PRODUCT USING THE APPROPRIATE DESIGN PROCEDURE AND/OR STANDARD(S) AS REQUIRED BY THE BUILDING CODE. CONTACT MANUFACTURE'S REPRESENTATIVE FOR THE INITIAL TRAINING AND INSTALLATION OF ANCHORS AND FOR PRODUCT RELATED QUESTIONS AND AVAILABILITY.

PA2 POST INSTALLED CONCRETE ANCHORS SHALL BE OF SIZE, TYPE, AND QUANTITY AS NOTED ON DETAILS, AS MANUFACTURED BY HILTI, SIMPSON STRONG-TIE ANCHOR SYSTEMS OR POWERS FASTENERS. NO OTHER MANUFACTURER PERMITTED. ANCHORS FROM ONLY ONE MANUFACTURER SHALL BE UTILIZED ON THE PROJECT.

PA3 HOLES IN CONNECTION PLATES FOR EXPANSION BOLTS SHALL NOT BE MORE THAN 1/16" LARGER THAN THE BOLT DIAMETER. IF FIELD CONDITIONS OR TOLERANCES REQUIRE LARGER HOLES, PROVIDE PLATE WASHERS WITH BOLTS HOLES 1/16" LARGER THAN BOLT DIAMETER THAT ARE WELDED TO THE CONNECTION PLATE. THE CONTRACTOR SHALL SIZE THE PLATE WASHERS AND WELDS TO TRANSFER THE SHEAR AND TENSION CAPACITY OF THE EXPANSION BOLT.

PA4 ALL POST INSTALLED BOLTS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS.

PA5 PRIOR TO DRILLING FOR ANCHORS, A PACHOMETER OR ANOTHER APPROVED METHOD SHALL BE USED TO LOCATE EXISTING REINFORCING TO ENSURE THERE IS NO CONFLICT. IF A CONFLICT EXISTS, THE ANCHORS POSITION CAN BE ADJUSTED BY NO MORE THAN 1 INCH. IF A LARGER DEVIATION IS NECESSARY, CONTACT THE ENGINEER.

PA6 ONCE THE FINAL POSITION OF THE ANCHORS IS SET, TEMPLATES SHALL THEN BE UTILIZED TO TRANSFER THE FINAL LOCATION OF THE BOLT GROUP ON TO THE CONNECTION PLATE.

PA7 CONSTRUCTION OF POST INSTALLED ANCHORS REQUIRES CONTINUOUS INSPECTION BY THE TESTING LAB TO ENSURE PROPER EMBEDMENT AND INSTALLATION PER MANUFACTURER'S SPECIFICATIONS.

PA8 CONCRETE ANCHORS

i. MECHANICAL ANCHORS SHALL HAVE BEEN TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ACI 355.2 AND ICC-ES AC193 FOR CRACKED AND UNCRACKED CONCRETE RECOGNITION. PRE-APPROVED MECHANICAL ANCHORS INCLUDE:
- A. SCREW ANCHOR(S):
  - (a) SIMPSON STRONG-TIE TITEN-HD (ICC-ES ESR-2713)
  - (b) HILTI KWIK HUS-EZ (ICC-ES ESR-3027)
- B. EXPANSION ANCHOR(S):
  - (a) SIMPSON STRONG-TIE STRONG-BOLT OR STRONG-BOLT 2 WEDGE ANCHOR (ICC-ES ESR-1771, ESR-3037)
  - (b) HILTI KWIK BOLT TZ EXPANSION ANCHOR (ICC-ES ESR-1917)

ii. EPOXY AND ADHESIVE ANCHORS SHALL HAVE BEEN TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ICC-ES AC308 FOR CRACKED AND UNCRACKED CONCRETE RECOGNITION. PRE-APPROVED EPOXY AND ADHESIVE ANCHORS INCLUDE:
- A. EPOXY ANCHOR(S):
  - (a) HILTI HIT-RE 500 V3 SAFE SET SYSTEM WITH HILTI HOLLOW DRILL BIT (TE-CD OR TE-YD) AND VC 20/40 VACUUM (VC 20-U OR VC 40-U) WITH HAS-E THREADED ROD (ICC ESR-3814)
  - (b) SIMPSON STRONG-TIE SET-XP (ICC-ES ESR-2508)
- B. ADHESIVE ANCHOR(S):
  - (a) HILTI HIT-HY 200 SAFE SET SYSTEM WITH HILTI HIT-Z ROD (ICC ESR-3187)
  - (b) HILTI HIT-HY 200 SAFE SET SYSTEM WITH HILTI HOLLOW DRILL BIT (TE-CD OR TE-YD) AND VC 20/40 VACUUM (VC 20-U OR VC 40-U) WITH HAS-E THREADED ROD (ICC ESR-3187)

PA9 MASONRY ANCHORS

i. ANCHORAGE TO SOLID-GROUTED CONCRETE MASONRY
(1) MECHANICAL ANCHORS SHALL HAVE BEEN TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ICC-ES AC01 OR AC106. PRE-APPROVED MECHANICAL ANCHORS INCLUDE:
- A. SCREW ANCHOR(S):
  - (a) HILTI KWIK HUS-EZ SCREW ANCHOR (ICC-ES ESR-3056)
  - (b) SIMPSON STRONG-TIE TITEN-HD (ICC-ES ESR-1056)
- B. EXPANSION ANCHOR(S):
  - (a) HILTI KWIK BOLT TZ EXPANSION ANCHOR (ICC-ES ESR-3785)
  - (b) SIMPSON STRONG-TIE WEDGE-ALL (ICC-ES ESR-1396)

(2) ADHESIVE AND EPOXY ANCHORS SHALL HAVE BEEN TESTED AND QUALIFIED FOR USE IN ACCORDANCE WITH ICC-ES AC58. PRE-APPROVED ADHESIVE AND EPOXY ANCHORS INCLUDE:
- A. ADHESIVE ANCHOR(S):
  - (a) HILTI HIT-HY 200 ADHESIVE ANCHOR SYSTEM (ICC-ES ESR-3963)
- B. EPOXY ANCHOR(S):
  - (a) SIMPSON STRONG-TIE SET (ICC-ES ESR-1772)

ii. ANCHORAGE TO HOLLOW CONCRETE MASONRY/UNREINFORCED CLAY BRICK MASONRY
(1) ADHESIVE AND EPOXY ANCHORS WITH SCREEN TUBES SHALL BE TESTED AND QUALIFIED IN ACCORDANCE WITH ICC-ES AC58 OR AC60, AS APPROPRIATE. THE APPROPRIATE SCREEN TUBE SHALL BE USED AS RECOMMENDED BY THE ADHESIVE MANUFACTURER. PRE-APPROVED ADHESIVE AND EPOXY ANCHORS WITH SCREEN TUBES INCLUDE:
- A. ADHESIVE ANCHOR(S):
  - (a) HILTI HIT-HY 70 ADHESIVE ANCHOR SYSTEM (ICC-ES ESR-3342)
- B. EPOXY ANCHOR(S):
  - (a) SIMPSON STRONG-TIE SET (ICC-ES ESR-1772)

STRUCTURAL CONCRETE UNIT MASONRY:

SM1 THESE NOTES APPLY ONLY TO THE CONCRETE UNIT MASONRY SHOWN ON THE STRUCTURAL FRAMING PLANS. CONCRETE UNIT MASONRY NOT SHOWN ON THE STRUCTURAL FRAMING PLANS IS NOT PART OF THE STRUCTURAL FRAME AND IS CONSIDERED ARCHITECTURAL CONCRETE UNIT MASONRY.

SM2 HOWEVER, ARCHITECTURAL CONCRETE UNIT MASONRY MAY ALSO REQUIRE REINFORCING AND REQUIREMENTS FOR THIS REINFORCING CAN BE FOUND AS FOLLOWS:

A. ARCHITECTURAL CONCRETE UNIT MASONRY REINFORCING:
1. REFER TO "NON-LOAD BEARING (ARCHITECTURAL) CONCRETE UNIT MASONRY WALL VERTICAL REINFORCING SCHEDULE" IN THE STRUCTURAL DRAWINGS.
2. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.

B. ARCHITECTURAL CONCRETE UNIT MASONRY HORIZONTAL REINFORCING (INCLUDING HORIZONTAL JOINT REINFORCING):
1. REFER TO THE TYPICAL DETAILS IN THE STRUCTURAL DRAWINGS FOR HORIZONTAL REINFORCING IN LINTELS AND BOND BEAMS OVER WALL OPENINGS.

SM3 THE STRUCTURAL MASONRY SHOWN ON THE PLANS IS PART OF THE LATERAL LOAD RESISTING SYSTEM OF THE BUILDING. THE STRUCTURAL DETAILS INCLUDING CLIP ANGLES, DOWELS, AND ADDITIONAL SECONDARY FRAMING MEMBERS ETC. SHOWN ARE CRITICAL TO THE LATERAL PERFORMANCE OF THE BUILDING.

SM4 MASONRY CONSTRUCTION REQUIRES SPECIAL INSPECTION. REFERENCE SPECIAL INSPECTION REQUIREMENTS ON THE INSPECTIONS SCHEDULE SHEET.

SM5 MASONRY PRISM STRENGTH (F'm) = 1,500 PSI, MINIMUM.

SM6 HOLLOW LOAD BEARING MASONRY UNITS SHALL CONFORM TO ASTM C 90, LIGHTWEIGHT, GRADE N, TYPE I OR II, WITH A MINIMUM COMPRESSIVE STRENGTH OF 1,900 PSI ON THE NET AREA OF THE BLOCK.

SM7 MORTAR SHALL CONFORM TO ASTM C 270, TYPE S WITH A MINIMUM COMPRESSIVE STRENGTH OF 1,800 PSI. PROPORTIONS BY VOLUME SHALL BE 1 PART PORTLAND CEMENT, 1/2 PART HYDRATED LIME AND 3 1/2 TO 4 1/2 PARTS MASON'S SAND. DO NOT USE AIR ENTRAINING LIME, MASONRY CEMENT OR ADMIXTURES. MEASURE MATERIALS WITH A BATCHING BOX - DO NOT MEASURE MATERIALS WITH A SHOVEL.

SM8 COARSE GROUT SHALL CONFORM TO ASTM C 476, WITH A MAXIMUM AGGREGATE SIZE OF 3/8" AND A MINIMUM COMPRESSIVE STRENGTH OF 2,500 PSI. PROPORTIONS BY VOLUME SHALL BE 1 PART PORTLAND CEMENT, 2 1/4 TO 3 PARTS MASON'S SAND AND 1 TO 2 PARTS PEA GRAVEL. SLUMP SHALL BE 10" TO 11".

SM9 REINFORCING STEEL SHALL CONSIST OF DEFORMED GRADE 60 BARS CONFORMING TO ASTM A615. BARS SHALL BE NEW BILLET STEEL OF A DOMESTIC MANUFACTURE.

SM10 GROUT SHALL BE MECHANICALLY CONSOLIDATED (VIBRATED), AND RECONSOLIDATED, USING A VIBRATOR WITH A MAXIMUM 3/4" DIAMETER HEAD.

SM11 CONCRETE MASONRY UNITS SHALL BE LAID IN RUNNING (COMMON) BOND.

SM12 CONCRETE MASONRY UNITS LOCATED BELOW GRADE SHALL HAVE ALL CELLS FULLY GROUTED AND CONCRETE MASONRY UNITS LOCATED ABOVE GRADE SHALL BE GROUTED ONLY AT REINFORCED CELLS AND BOND BEAMS, UNLESS NOTED OTHERWISE.

SM13 PROVIDE DOWELS BETWEEN FOUNDATION AND MASONRY WALLS SHOWN ON THE STRUCTURAL FRAMING PLANS. DOWELS SHALL MATCH SIZE AND SPACING OF THE VERTICAL MASONRY WALL REINFORCING AND SHALL EXTEND AT LEAST 48 BAR DIAMETERS INTO BOTH THE FOUNDATION AND THE MASONRY WALLS.

SM14 VERTICAL WALL REINFORCING:

A. REFER TO THE STRUCTURAL CMU WALL VERTICAL REINFORCING SCHEDULE FOR WALL REINFORCEMENT.
B. UNLESS NOTED OTHERWISE, STRUCTURAL CMU WALL VERTICAL REINFORCING SHALL BE PLACED IN GROUTED CELLS AS INDICATED IN THE DRAWINGS. (NOTE: PLACE REINFORCING IN THE CENTER OF THE CELL AT THE SPECIFIED SPACING EXCEPT WHERE "E.F." IS INDICATED. WHERE E.F. IS INDICATED PLACE 2 OF THE SPECIFIED BAR SIZE IN EACH CELL AT THE SPECIFIED SPACING WITH ONE BAR ON THE INSIDE FACE AND ONE BAR ON THE OUTSIDE FACE OF THE WALL.
C. REFER TO TYPICAL DETAIL "REINF. SPLICE @ ACOUSTICAL CMU" FOR SPECIAL REINFORCING PLACEMENT REQUIREMENTS FOR WALLS THAT INCORPORATE "ACOUSTICAL UNITS".
D. THE FIRST 3 CELLS AT CORNERS AND ENDS OF THE WALLS SHALL BE REINFORCED WITH THE SAME SIZE AND NUMBER OF REINFORCING BARS AS SPECIFIED FOR THE OTHER REINFORCED CELLS IN THE WALL AND GROUTED FULL.
E. AT OPENINGS, PROVIDE EXTRA REINFORCED GROUTED FULL HEIGHT CONSECUTIVE CELLS EACH SIDE OF THE OPENING EQUAL TO ONE HALF THE TOTAL NUMBER OF THE CELLS INTERRUPTED BY THE OPENING. REINFORCE EACH CELL WITH THE SAME SIZE AND NUMBER OF BARS AS SPECIFIED FOR THE INTERRUPTED CELLS. PROVIDE A MINIMUM OF 2 REINFORCED GROUTED CELLS EACH SIDE OF OPENING.
F. HOLD VERTICAL REINFORCING IN POSITION AT TOP AND BOTTOM AND AT 8'-0" O.C. MAXIMUM.
G. VERTICAL BARS MAY BE SPLICED IN 8'-0" (+ or -) LENGTHS. SPLICES LOCATED IN ADJACENT CELLS SHALL BE STAGGERED SUCH THAT NOT MORE THAN 50 PERCENT OF THE BARS ARE SPLICED AT THE SAME LOCATION. MINIMUM LAP AT SPLICE SHALL BE 50 BAR DIAMETERS FOR #3 TO #6 BARS AND 62 BAR DIAMETERS FOR #7 TO #11 BARS.

SM15 HORIZONTAL WALL REINFORCING IN BOND BEAMS OR TROUGH BLOCK UNITS SHALL BE STRAIGHT, PLACED CONTINUOUSLY AND FULLY GROUTED IN PLACE. REFER TO SCHEDULES, SECTIONS AND DETAILS FOR SPECIFIED HORIZONTAL REINFORCING. SPLICE BARS WHERE REQUIRED WITH 50 BAR DIAMETER LAP, MINIMUM. TYP. U.N.O. AND TIE THEM WITH WIRE. USE OPEN KNOCK OUT BOND BEAM BLOCK. DO NOT USE TROUGH TYPE BLOCKS FOR BOND BEAMS. DO NOT CONTINUE BOND BEAM REINFORCING THROUGH CONTROL JOINTS, UNLESS NOTED OTHERWISE.

SM16 REFER TO SCHEDULES, SECTIONS AND DETAILS FOR REINFORCING IN GROUTED COLUMNS, PILASTERS AND BEAMS. CLEAR GROUT COVER MEASURED TO THE OUTERMOST BAR, STIRRUP OR TIE SHALL BE 1".

SM17 CONTINUOUS HORIZONTAL JOINT REINFORCING:

A. SINGLE WYTHE WALLS:

1. CONTINUOUS HORIZONTAL WALL JOINT REINFORCING FOR SINGLE WYTHE WALLS SHALL BE GALVANIZED, STANDARD TRUSS TYPE "DUR-O-WAL", OR EQUAL, AT 16" ON CENTER, VERTICAL, TYPICAL, U.N.O.

B. CAVITY WALLS:

1. WHERE MODULAR MASONRY UNITS ARE BACKED UP BY CONCRETE MASONRY UNITS, PROVIDE GALVANIZED, STANDARD, TRIROD, TRUSS TYPE "DUR-O-WAL", OR EQUAL, AT 16" ON CENTER, VERTICALLY, TYPICAL, U.N.O.
2. WHERE NON-MODULAR MASONRY UNITS, SUCH AS KING SIZE BRICK, ARE BACKED UP CONCRETE MASONRY UNITS, PROVIDE GALVANIZED, STANDARD, ADJUSTABLE ("PINTLE"), TRUSS TYPE "DUR-O-WAL", OR EQUAL, AT 16" ON CENTER, VERTICALLY, TYPICAL, U.N.O.
3. PROVIDE CONTINUITY AT CORNERS AND INTERSECTIONS WITH PREFABRICATED CORNER AND TEE UNITS.
4. SPLICE STANDARD HORIZONTAL WALL JOINT WIRE REINFORCING 11" MINIMUM AND PROVIDE AT LEAST ONE CROSS WIRE OF EACH PIECE OF REINFORCEMENT IN THE LAPPED DISTANCE.
5. COVER FROM JOINT REINFORCING TO EDGE OF MORTAR SHALL BE 5/8".

SM18 REFER TO CMU WALL REINFORCING DIAGRAM, TYPICAL MASONRY WALL OPENING DIAGRAM AND SCHEDULE, AND SPECIAL WALL SECTION SCHEDULE AND DETAILS FOR ADDITIONAL REINFORCING AT OPENINGS, CONTROL JOINTS, CORNERS AND ENDS OF WALL PANELS.

SM19 PROVIDE SHOP DRAWINGS SHOWING DETAILS OF BENDING AND PLACEMENT OF MASONRY REINFORCING BARS. COMPLY WITH ACI 315, "DETAILS AND DETAILING OF CONCRETE REINFORCEMENT." SHOP DRAWINGS SHALL INCLUDE ELEVATIONS OF REINFORCED WALLS AT OPENINGS AND AT OTHER LOCATIONS WHERE THE SPECIFIED REINFORCING IS MORE INVOLVED THAN SIMPLE VERTICAL BARS AT A SPECIFIED SPACING.

SM20 UNGROUTED MASONRY WALL CELLS MAY BE REQUIRED TO BE FILLED WITH SAND, VERMICULITE OR PERLITE FOR FIRE RATING, SOUNDPROOFING OR OTHER PURPOSES. REFER TO THE ARCHITECTURAL DRAWINGS FOR THESE REQUIREMENTS.

SM21 VERTICAL THROUGH-WALL CONTROL JOINTS: WHERE NOT INDICATED IN THE STRUCTURAL DRAWINGS, PROVIDE 3/8" VERTICAL THROUGH-WALL CONTROL JOINTS AT **TO 12'-6"** FROM CORNERS AND AT **30'-0"** O.C. MAX. IN BETWEEN. THE ARCHITECTURAL DRAWINGS MAY SHOW VERTICAL CONTROL JOINTS IN THE MASONRY FACADE AT EACH EDGE OF WALL OPENINGS. HOWEVER, CONTROL JOINTS IN THE BACKUP CMU SHALL NOT BE LOCATED WITHIN WALL OPENINGS, AT THE EDGE OF WALL OPENINGS OR WITHIN THE VERTICAL GROUTED CELLS AT EACH SIDE OF THE WALL OPENINGS, REGARDLESS OF WHERE THE CONTROL JOINTS ARE SHOWN IN THE ARCHITECTURAL DRAWINGS FOR THE MASONRY FACADE. COORDINATE JOINT LOCATIONS TO MISS BEAM AND JOIST BEARINGS. ALL HORIZONTAL REINFORCING AT CONTROL JOINTS SHALL BE CUT, TYPICAL U.N.O.. PROVIDE GROUTED CELLS AND REINFORCING AT EACH SIDE OF THE JOINT THE SAME AS AT THE END OF THE WALL. THE CONTRACTOR SHALL SUBMIT JOINT LAYOUT TO THE ARCHITECT AND ENGINEER FOR REVIEW AND APPROVAL PRIOR TO STARTING WALL CONSTRUCTION. FOR STRUCTURAL MASONRY WALLS THAT ARE SHOWN IN THE STRUCTURAL DRAWINGS, THIS CRITERIA FOR CONTROL JOINT LOCATIONS TAKES PRIORITY OVER JOINT LOCATIONS THAT MAY OR MAY NOT BE SHOWN IN THE ARCHITECTURAL DRAWINGS FOR STRUCTURAL MASONRY WALLS.

SM22 GROUT POURS SHALL BE LIMITED TO 12 FEET IN HEIGHT FOR 8" AND THICKER WALLS AND 5 FEET IN HEIGHT FOR 6" THICK WALLS. BETWEEN GROUT POURS, FORM CONSTRUCTION JOINT BY LEAVING GROUT 1 1/2 INCHES BELOW THE MORTAR JOINT (1/2 INCH AT BOND BEAMS).

SM23 CLEANOUTS ARE REQUIRED FOR GROUT POURS OVER 5 FT. PROVIDE CLEANOUTS IN THE BOTTOM COARSE OF THE GROUT POUR AT EVERY VERTICAL BAR MINIMUM. CLEANOUTS SHALL BE ON NON-FINISHED SIDE OF MASONRY CONSTRUCTION.

SM24 PROVIDE TEMPORARY LATERAL WALL BRACING AS REQUIRED UNTIL THE FLOOR AND ROOF CONSTRUCTION, INCLUDING ALL STRUCTURAL COMPONENTS, AT THE TOP AND THE BOTTOM OF THE WALLS HAVE BEEN COMPLETED.

1 GENERAL NOTES CONTINUED
12" = 1'-0"

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SHEET CONTENTS:
GENERAL NOTES

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STRUCTURAL STEEL FRAMING:

SS1 ALL STRUCTURAL STEEL SHALL MEET THE FOLLOWING MINIMUM YIELD STRENGTHS AND ASTM SPECIFICATIONS:

STRUCTURAL STEEL TYPE	YIELD STRESS, Fy	TENSILE STRESS, Fu	ASTM SPECIFICATION
WIDE FLANGE AND WT SHAPES	50 KSI	65 KSI	A992
HOLLOW STRUCTURAL SECTIONS	46 KSI	58 KSI	A500, GRADE B
PIPES	35 KSI	60 KSI	A53 TYPE E, GRADE B
ANGLES	36 KSI	58 KSI	A36
CHANNELS	36 KSI	58 KSI	A36
BARS	36 KSI	58 KSI	A36
PLATES	36 KSI	58 KSI	A36
	50 KSI	65 KSI	A572, GRADE 50
BOLTS (HEAVY-HEX)	92 KSI	120 KSI	A325
NUTS (HEAVY-HEX)	92 KSI	120 KSI	A325
WASHERS	36 KSI	58 KSI	F436
ANCHOR RODS	36 KSI	58 KSI	F1554, GRADE 36
	55 KSI	75 KSI	F1554, GRADE 55
	105 KSI	125 KSI	F1554, GRADE 105
SHEAR-STUD CONNECTORS	50 KSI	65 KSI	A108
RAISED-PATTERN FLOOR PLATE	-	-	A786, COMMERCIAL GRADE

SS2 WHERE CAMBER OF STEEL BEAMS IS SPECIFIED ON THE PLANS, CAMBER OF STEEL BEAMS MUST COMPLY WITHIN LIMITS SET BY AISC. SUPPORT CAMBERED STEEL MEMBERS IN A MANNER THAT WILL NOT RESULT IN ANY LOSS OF CAMBER DURING SHIPPING AND HANDLING. THE TESTING LAB SHALL VERIFY THE SPECIFIED BEAM CAMBERS AT THE JOBSITE WITH THE BEAMS LYING FLAT ON THE GROUND (WEBS PARALLEL TO THE GROUND). BEAMS WHOSE CAMBER FALLS OUTSIDE THE TOLERANCE SHALL BE RETURNED TO THE SHOP FOR CORRECTION.

SS3 BOLTS FOR STEEL BEAM AND COLUMN CONNECTIONS SHALL BE 3/4" DIAMETER ASTM A 325-N HIGH-STRENGTH BOLTS, UNO. ALL BOLTED CONNECTIONS ARE BEARING TYPE. ALL BOLTS SHALL BE TIGHTENED SNUG TIGHT, UNO. ALL THE NUTS AND BOLTS (INCLUDING ANCHOR BOLTS) USED IN THE CRAWL SPACE AND BELOW COOLING TOWER SUPPORTS SHALL BE HOT DIP GALVANIZED.

SS4 WELDING SHALL MEET ANSI/AWS D1.1 STRUCTURAL WELDING CODE. ELECTRODES SHALL BE 70 KSI LOW HYDROGEN.

SS5 STEEL CONNECTION NOTES:

1. THE DESIGN OF THE STRUCTURAL STEEL CONNECTIONS, WHICH ARE NOT FULLY DETAILED IN THESE DRAWINGS, IS THE RESPONSIBILITY OF THE CONTRACTOR AND THE STEEL FABRICATOR. THE DESIGN OF THE CONNECTIONS SHALL BE PERFORMED BY A LICENSED PROFESSIONAL ENGINEER WORKING FOR THE FABRICATOR IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE AISC 303 - CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES.

2. THE FABRICATOR'S LICENSED PROFESSIONAL ENGINEER IN RESPONSIBLE CHARGE OF THE CONNECTION DESIGN SHALL REVIEW AND CONFIRM IN WRITING THAT THE SHOP AND ERECTION DRAWINGS PROPERLY INCORPORATE THE CONNECTION DESIGNS PRIOR TO SUBMITTING THE CONNECTION CALCULATIONS AND SHOP DRAWINGS TO THE ENGINEER-OF-RECORD FOR REVIEW AND FINAL APPROVAL.

3. THE FABRICATOR SHALL PROVIDE A MEANS BY WHICH THE CONNECTION INFORMATION PREPARED BY THE FABRICATOR'S LICENSED PROFESSIONAL ENGINEER IN RESPONSIBLE CHARGE OF THE CONNECTION DESIGN IS REFERENCED TO THE RELATED CONNECTIONS ON THE SHOP AND ERECTION DRAWINGS FOR THE PURPOSE OF REVIEW.

4. THE FABRICATOR SHALL PROVIDE BEAM CONNECTIONS USING THE VERTICAL REACTIONS PROVIDED ON THE PLANS, WHICH ARE PROVIDED AS KIPS (SERVICE-LOAD LEVEL). ALLOWABLE STRESS DESIGN (ASD) SHALL BE USED IN THE SELECTION, COMPLETION AND DESIGN OF CONNECTION DETAILS. WHERE REACTIONS ARE NOT PROVIDED ON THE PLANS, BEAM REACTIONS SHALL BE AS FOLLOWS:

BEAM SIZE	MINIMUM REACTION IN KIPS (SERVICE-LOAD LEVEL)	BEAM SIZE	MINIMUM REACTION IN KIPS (SERVICE-LOAD LEVEL)
W8	11	W24	85
W10	14	W27	100
W12	24	W30	120
W14	28	W33	143
W16	33	W36	161
W18	49	W40	178
W21	61	W44	196

5. WHERE HORIZONTAL FORCES ARE INDICATED ON PLAN AS "H=_K", THE LICENSED PROFESSIONAL ENGINEER WORKING FOR THE FABRICATOR SHALL SIZE THE CONNECTION TO TRANSFER THE HORIZONTAL FORCE IN ADDITION TO THE REQUIRED VERTICAL REACTION. SLOTTED HOLES ARE NOT PERMITTED AT CONNECTIONS WITH HORIZONTAL FORCES.

6. REFER TO THE SIMPLE SHEAR STEEL BEAM CONNECTION DETAIL FOR ADDITIONAL CONNECTION REQUIREMENTS AND INFORMATION.

SS6 PROVIDE DOUBLE NUTS AND DOUBLE WASHERS FOR STEEL COLUMN ANCHOR BOLTS TO ALLOW FOR ADJUSTMENT IN BASE PLATE ELEVATION. PROVIDE HIGH STRENGTH, NON SHRINK, NON METALLIC GROUT BELOW BASE PLATES. REFER TO SPECIFICATION FOR GROUT REQUIREMENTS.

SS7 PROVIDE L3x3x1/4 FIELD-FABRICATED FRAME BETWEEN ROOF MEMBERS AT OPENINGS IN ROOF GREATER THAN 10"x10", UNO. REFER TO TYPICAL MISCELLANEOUS ROOF OPENING FRAME DETAIL.

SS8 ALL STRUCTURAL STEEL, EXCEPT EMBEDDED ITEMS, SHALL BE PAINTED WITH ONE SHOP COAT OF RUST INHIBITIVE PAINT. DO NOT PAINT TOP FLANGE OF COMPOSITE STEEL BEAMS OR SURFACE OF COLUMNS TO WHICH SHEAR STUD CONNECTORS WILL BE WELDED.

SS9 STRUCTURAL DRAWINGS SHALL NOT BE REPRODUCED IN WHOLE OR IN PART FOR SHOP DRAWING SUBMITTALS, ALSO SEE SD4.

SS10 UNLESS OTHERWISE NOTED, ALL MOMENT CONNECTIONS SHALL BE MADE WITH FULL PENETRATION WELDS AND SHALL BE DESIGNED TO DEVELOP THE FULL CAPACITY OF THE MEMBER.

SS11 WHERE STIFFENER PLATES ARE SHOWN IN THE DRAWINGS, THEY ARE REQUIRED AND MUST BE PROVIDED AS SHOWN.

SS12 TEMPORARY SUPPORTS, BRACES, FALSE WORK, SHORES, CRIBBING OR OTHER SUPPORTS REQUIRED DURING ERECTION TO KEEP STRUCTURAL STEEL SECURE, SUPPORTED, PLUMB, AND IN ALIGNMENT SHALL BE DESIGNED, FURNISHED AND INSTALLED BY THE CONTRACTOR AND STEEL ERECTOR. THESE TEMPORARY SUPPORTS SHALL SECURE THE STRUCTURAL STEEL FRAMING, OR ANY PARTLY ASSEMBLED STEEL FRAMING, AGAINST ALL LATERAL AND VERTICAL LOADS, INCLUDING BUT NOT LIMITED TO THOSE RESULTING FROM WIND, SEISMIC, ERECTION OPERATIONS AND THE WEIGHT OF THE STRUCTURE AND SUPPORTED ELEMENTS. ALL TEMPORARY SUPPORTS SHALL REMAIN IN PLACE DURING CONSTRUCTION UNTIL THE PERMANENT STRUCTURAL STEEL, CONNECTIONS, FLOOR DECKS AND BRACING ELEMENTS SHOWN IN THE DRAWINGS ARE COMPLETE.

SS13 ALL STRUCTURAL STEEL AND CONNECTIONS EXPOSED TO WEATHER SHALL BE HOT DIP GALVANIZED G-90 COATING. COOLING TOWER GRILLAGE SHALL BE GALVANIZED WITH G-135 COATING. ANY DAMAGE TO THE GALVANIC MATERIAL DURING WELDING SHALL BE TOUCHED UP WITH GALVANIZING REPAIR PAINT: HIGH-ZINC-DUST-CONTENT PAINT FOR REGALVANIZING WELDS AND REPAIR PAINTING GALVANIZED STEEL, WITH DRY FILM CONTAINING NOT LESS THAN 93 PERCENT ZINC DUST BY WEIGHT, AND COMPLYING WITH DOD-P-21035A OR SSPC-PAINT 20.

SS14 WHERE FILLET WELD SIZE IS NOT SHOWN ON A DETAIL, ITS SIZE SHALL BE ASSUMED TO BE THE PLATE THICKNESS OF THE THINNEST PIECE MINUS 1/16", BUT IN NO CASE SHALL THE FILLET WELD BE LESS THAN 3/16" UNLESS NOTED OTHERWISE.

SS15 BEAMS WITH LATERAL BRACING ATTACHED AND WEB CONNECTIONS OF MOMENT-CONNECTED BEAMS SHALL UTILIZE SLIP CRITICAL BOLTS OR WELDED CONNECTIONS.

SS16 WELDING: ALL WELDING SHALL BE PERFORMED BY WELDERS CERTIFIED FOR THE WELDS TO BE MADE; SEE SPECIFICATIONS FOR WELDING PROCESS TO BE USED. WELDING OF REINFORCING STEEL FOR USE IN STRUCTURAL CONCRETE OR STRUCTURAL MASONRY SHALL BE PERMITTED ONLY WHERE SPECIFICALLY DESIGNATED ON THESE PLANS OR WHERE SPECIFICALLY APPROVED BY THE ENGINEER.

SS17 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS): WHERE NOTED ON PLANS OR BY THE ARCHITECT SHALL CONFORM TO AISC 303 SECTION 10.

SS18 LEDGER ANGLE FOR FASCIA BRICK SUPPORT SHALL BE INSTALLED SUCH THAT THE SWEEP OR CAMBER DOES NOT EXCEED $\frac{1}{8}$ INCH DEVIATION FROM STRAIGHT LINE.

METAL ROOF DECKING:

MD1 METAL ROOF DECKING SIZES ARE SHOWN ON PLANS AND SHALL HAVE THE FOLLOWING MINIMUM PROPERTIES

METAL ROOF DECK SCHEDULE									
TYPE	GAUGE	PROFILE	DEPTH (IN)	MOMENT OF INERTIA (+) (IN4)	MOMENT OF INERTIA (-) (IN4)	SECTION MODULUS (+) (IN3)	SECTION MODULUS (-) (IN3)	YIELD STRENGTH (KSI)	NRC
1.5WR	18	WIDE RIB	1.5	0.289	0.295	0.318	0.327	80	-
	20	WIDE RIB	1.5	0.201	0.222	0.234	0.247	80	-
	22	WIDE RIB	1.5	0.155	0.183	0.186	0.192	80	-

MD2 THE METAL ROOF DECK IS REQUIRED TO ACT AS A DIAPHRAGM. REFER TO THE ROOF DIAPHRAGM FASTENER DIAGRAM AND SCHEDULE FOR REQUIRED ATTACHMENT PATTERN.

MD3 THE METAL ROOF DECK IS DESIGNED TO BE CONTINUOUS OVER THREE OR MORE SPANS. THE METAL DECK SUPPLIER SHALL ADJUST THE THICKNESS OR GAUGE OF THE DECK AT LOCATIONS WHERE SINGLE OR DOUBLE SPAN CONDITIONS ARE PROVIDED. DECK SHALL BE DESIGNED TO PROVIDE EQUIVALENT OR GREATER LOAD CAPACITY AS THE SPECIFIED DECK SUPPORTED OVER THREE CONTINUOUS SPANS.

MD4 ALL METAL ROOF DECKING SHALL BE GALVANIZED WITH [G90] COATING CONFORMING TO ASTM A924.

MD5 COORDINATE METAL DECK LENGTHS WITH THE FINAL JOIST AND BEAM LAYOUT. THE FINAL JOIST AND BEAM LAYOUT CAN BE DIFFERENT THAN THAT SHOWN IN THE CONTRACT DRAWINGS DEPENDING ON WHETHER THE JOIST BEARING SEATS ARE BUTTED OR LAPPED. THE JOIST LOCATIONS SHOWN IN THE CONTRACT DRAWINGS DO NOT ACCOUNT FOR THE SMALL DIFFERENCE IN JOIST LOCATION DUE TO THE VARIOUS JOIST BEARING CONDITIONS THAT COULD EXIST IN THE FIELD.

MD6 SUSPENDED APPURTENANCES SUCH AS LIGHT FIXTURES, DUCTS AND OTHER UTILITIES SHALL NOT BE SUPPORTED FROM ROOF DECK.

STATEMENT OF SPECIAL INSPECTIONS:

SI1 THIS STATEMENT OF SPECIAL INSPECTIONS IS SUBMITTED IN ACCORDANCE WITH THE SPECIAL INSPECTION AND STRUCTURAL TESTING REQUIREMENTS OF THE BUILDING CODE WITH LOCAL AMENDMENTS. IT INCLUDES A SCHEDULE OF SPECIAL INSPECTIONS SERVICES APPLICABLE TO THIS PROJECT.

SI2 THE OWNER SHALL EMPLOY ONE OR MORE QUALIFIED SPECIAL INSPECTORS, APPROVED BY THE BUILDING OFFICIAL, TO PERFORM SPECIAL INSPECTIONS AND TESTS DURING CONSTRUCTION IN ACCORDANCE WITH BUILDING CODE. SPECIAL INSPECTORS SHALL PERFORM ALL DUTIES AND RESPONSIBILITIES AS REQUIRED BY THE BUILDING CODE. JOB SITE VISITS BY THE STRUCTURAL ENGINEER DO NOT CONSTITUTE AND ARE NOT A SUBSTITUTE FOR SPECIAL INSPECTIONS. ALL INSPECTORS SHALL BE QUALIFIED BY TRAINING AND EXPERIENCE FOR THE REQUIRED INSPECTIONS AND TEST PROCEDURES.

SI3 THE SPECIAL INSPECTOR SHALL KEEP RECORDS OF ALL SPECIAL INSPECTIONS AND TESTS AND SHALL SUBMIT REPORTS OF INSPECTIONS AND TESTS TO THE BUILDING OFFICIAL AND THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. REPORTS SHALL INDICATED THAT WORK INSPECTED OR TESTED WAS OR WAS NOT COMPLETED IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO COMPLETION OF THAT PHASE OF THE WORK. INTERIM TESTING AND INSPECTION REPORTS SHALL BE SUBMITTED ON A DAILY BASIS TO THE BUILDING OFFICIAL AND THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. A FINAL REPORT DOCUMENTING THE REQUIRED SPECIAL INSPECTIONS AND TESTS, AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS OR TESTS, SHALL BE SUBMITTED AT A POINT IN TIME AGREED UPON PRIOR TO THE START OF WORK BY THE OWNER OR THE OWNER'S AUTHORIZED AGENT TO THE BUILDING OFFICIAL.

SI4 IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO ENSURE THE REQUIRED SPECIAL INSPECTIONS AND TESTS ARE PERFORMED IN ACCORDANCE WITH THE BUILDING CODE AND CONSTRUCTION DOCUMENTS. THE SPECIAL INSPECTION PROGRAM DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO COMPLY WITH THE CONTRACT DOCUMENTS. JOB SITE SAFETY AND MEANS AND METHODS OF CONSTRUCTION ARE SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.

SI5 ARCHITECTURAL, MECHANICAL AND ELECTRICAL COMPONENTS REQUIRING SPECIAL INSPECTIONS AND TESTING PER THE BUILDING CODE ARE NOT LISTED HERE. REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR SPECIAL INSPECTION REQUIREMENTS FOR THESE COMPONENTS.

SI6 THE FOLLOWING SPECIAL INSPECTIONS AND TESTS SCHEDULE CONTAINS A LIST OF THE MATERIALS, SYSTEMS, COMPONENTS AND WORK REQUIRED TO HAVE SPECIAL INSPECTIONS AND/OR TESTS BY THE SPECIAL INSPECTOR RESPONSIBLE FOR EACH PORTION OF THE WORK. REFER TO THE GENERAL NOTES AND PROJECT SPECIFICATIONS FOR ADDITIONAL INSPECTION AND TESTING REQUIREMENTS. WHERE CONFLICTS OCCUR, THE MOST STRINGENT REQUIREMENT SHALL CONTROL.

SPECIAL INSPECTIONS AND TESTS SCHEDULE PER IBC 2015

CHECK IF APPLICABLE	MATERIALS, SYSTEMS, COMPONENTS AND WORK REQUIRED TO HAVE SPECIAL INSPECTIONS OR TESTS BY THE SPECIAL INSPECTOR RESPONSIBLE FOR EACH PORTION OF THE WORK	SPECIAL INSPECTION SHALL BE PERFORMED IN ACCORDANCE WITH IBC SECTION	
■	STRUCTURAL STEEL	1705.2	
■	CONCRETE CONSTRUCTION	1705.3	
■	MASONRY CONSTRUCTION	1705.4	
☐	WOOD CONSTRUCTION	1705.5	
■	SOILS	1705.6	
☐	DRIVEN DEEP FOUNDATIONS	1705.7	
☐	CAST-IN-PLACE DEEP FOUNDATIONS	1705.8	
☐	HELICAL PILE FOUNDATIONS	1705.9	
☐	FABRICATED ITEMS	1705.10	
■	SPECIAL INSPECTIONS FOR WIND RESISTANCE	1705.11	ALTERNATE 1 ONLY
☐	SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE	1705.12	
☐	TESTING FOR SEISMIC RESISTANCE	1705.13	

1 GENERAL NOTES CONTINUED
12" = 1'-0"

DESIGN LOADS & DESIGN DATA

1.	BUILDING CODE		2015 INTERNATIONAL BUILDING CODE (IBC) / ASCE/SEI 7-10 WITH LOCAL AMENDMENTS	
2.	GRAVITY LOADS & DESIGN DATA			
	A.	DEAD LOADS		
		1. ROOF	SELF-WEIGHT + 5 PSF COLLATERAL	
		2. FLOOR	SELF-WEIGHT + 10 PSF COLLATERAL	
	B.	LIVE LOADS	UNIFORM	CONCENTRATED
		1. ROOF	40 PSF (UNREDUCIBLE)	3,000 LBS
		2. FLOOR	100 PSF (UNREDUCIBLE)	2,000 LBS
	C.	SNOW LOADS		
		1. GROUND SNOW LOAD, P_g	5 PSF	
		2. FLAT ROOF SNOW LOAD, P_f	9.2 PSF	
		3. SNOW EXPOSURE FACTOR, C_e	1.0	
		4. SNOW OCCUPANCY CATEGORY	IV	
		5. SNOW LOAD IMPORTANCE FACTOR, I	1.2	
		6. THERMAL FACTOR, C_t	1.0	
3.	LATERAL LOADS & DESIGN DATA			
	A.	WIND DESIGN DATA		
		1. BASIC WIND SPEED, V	120 MPH (3-SECOND GUST)	
		2. WIND OCCUPANCY CATEGORY	IV	
		3. WIND EXPOSURE CATEGORY	C	
		4. INTERNAL PRESSURE COEFFICIENT, GC_{pi}	±0.18	
		5. WIDTH OF END ZONE, (2a)	6 FT	
	B.	DESIGN WIND PRESSURES		
		1. MAIN WIND-FORCE RESISTING SYSTEM (MWFRS)		
		I. WALLS (WW+LW)		
		0'-15'	29.4 PSF	
		2. COMPONENTS AND CLADDING (EFFECTIVE AREA > 50 SF)		
		I. WALLS		
		INTERIOR ZONE	28.2 PSF	
		END ZONE	32.4 PSF	
		III. ROOF UPLIFT (GROSS) - ROOF ATTACHMENTS (AREA = 10 SF)		
		INTERIOR ZONE	31.4 PSF	
		END ZONE	52.7 PSF	
		CORNER ZONE	79.3 PSF	
		IV. ROOF UPLIFT (GROSS) - JOISTS (AREA >500 SF)		
		INTERIOR ZONE	28.7 PSF	
		END ZONE	34 PSF	
		CORNER ZONE	34 PSF	
	C.	SEISMIC DESIGN DATA		
		1. SEISMIC OCCUPANCY CATEGORY	IV	
		2. SEISMIC IMPORTANCE FACTOR, I	1.5	
		3. SHORT PERIOD MAPPED SPECTRAL RESPONSE ACCELERATION, S_s	0.063 g	
		4. 1-SEC PERIOD MAPPED SPECTRAL RESPONSE ACCELERATION, S_1	0.035 g	
		5. SITE CLASS	B	
		6. SHORT PERIOD SPECTRAL RESPONSE COEFFICIENT, S_{DS}	0.042 g	
		7. 1-SEC PERIOD SPECTRAL RESPONSE COEFFICIENT, S_{D1}	0.023 g	
		8. SEISMIC DESIGN CATEGORY	A	
		9. RESPONSE MODIFICATION FACTOR, R	2	
		10. SYSTEM OVERSTRENGTH FACTOR, Ω	2.5	
		11. DEFLECTION AMPLIFICATION FACTOR, Cd	1.75	
		12. SEISMIC RESPONSE COEFFICIENT, Cs	0.032	
		13. DESIGN BASE SHEAR, V	0.032W	
		14. BASIC SEISMIC FORCE-RESISTING SYSTEM	ORDINARY REINFORCED MASONRY SHEAR WALLS	
		15. ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE PROCEDURE	
4.	DEFLECTION LIMITS			
	A.	ROOF MEMBERS		
		1. LIVE LOAD MAXIMUM ALLOWABLE DEFLECTION	L/360	
		2. TOTAL LOAD MAXIMUM ALLOWABLE DEFLECTION	L/240	
	B.	FLOOR MEMBERS		
		1. LIVE LOAD MAXIMUM ALLOWABLE DEFLECTION	L/360	
		2. TOTAL LOAD MAXIMUM ALLOWABLE DEFLECTION	L/240	
	C.	MEMBERS SUPPORTING MASONRY		
		1. LIVE LOAD MAXIMUM ALLOWABLE DEFLECTION	L/600 or 0.3-INCH	
	D.	BUILDING FRAME		
		1. MAXIMUM ALLOWABLE STORY DRIFT	H/500 (TOTAL BUILDING HEIGHT)	

2 DESIGN LOADS
12" = 1'-0"

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG
SHEET CONTENTS:
GENERAL NOTES

DATE:
05/23/2019
JOB NO.:
18465.01

SHEET:
S0.02

DESIGN LOADS & DESIGN DATA **FOR ALTERNATE 1**

1.	BUILDING CODE		2015 INTERNATIONAL BUILDING CODE (IBC) / ASCE/SEI 7-10 WITH LOCAL AMENDMENTS	
2.	GRAVITY LOADS & DESIGN DATA			
	A.	DEAD LOADS		
		1. ROOF	SELF-WEIGHT + 5 PSF COLLATERAL	
		2. FLOOR	SELF-WEIGHT + 10 PSF COLLATERAL	
	B.	LIVE LOADS	UNIFORM	CONCENTRATED
		1. ROOF	40 PSF (UNREDUCIBLE)	3,000 LBS
		2. FLOOR	100 PSF (UNREDUCIBLE)	2,000 LBS
	C.	SNOW LOADS		
		1. GROUND SNOW LOAD, P_g	5 PSF	
		2. FLAT ROOF SNOW LOAD, P_f	9.2 PSF	
		3. SNOW EXPOSURE FACTOR, C_e	1.0	
		4. SNOW OCCUPANCY CATEGORY	IV	
		5. SNOW LOAD IMPORTANCE FACTOR, I	1.2	
		6. THERMAL FACTOR, C_t	1.0	
3.	LATERAL LOADS & DESIGN DATA			
	A.	WIND DESIGN DATA		
		1. BASIC WIND SPEED, V	165 MPH (3-SECOND GUST)	
		2. WIND OCCUPANCY CATEGORY	IV	
		3. WIND EXPOSURE CATEGORY	C	
		4. INTERNAL PRESSURE COEFFICIENT, GC_{pi}	±0.18	
		5. WIDTH OF END ZONE, (2a)	6 FT	
	B.	DESIGN WIND PRESSURES		
		1. MAIN WIND-FORCE RESISTING SYSTEM (MWFRS)		
		I. WALLS (WW+LW)		
		0'-15'	55.6 PSF	
		2. COMPONENTS AND CLADDING (EFFECTIVE AREA > 50 SF)		
		I. WALLS		
		INTERIOR ZONE	54.8 PSF	
		END ZONE	64.4 PSF	
		III. ROOF UPLIFT (GROSS) - ROOF ATTACHMENTS (AREA = 10 SF)		
		INTERIOR ZONE	59.3 PSF	
		END ZONE	99.6 PSF	
		CORNER ZONE	149.9 PSF	
		IV. ROOF UPLIFT (GROSS) - JOISTS (AREA >500 SF)		
		INTERIOR ZONE	54.3 PSF	
		END ZONE	64.4 PSF	
		CORNER ZONE	64.4 PSF	
	C.	SEISMIC DESIGN DATA		
		1. SEISMIC OCCUPANCY CATEGORY	IV	
		2. SEISMIC IMPORTANCE FACTOR, I	1.5	
		3. SHORT PERIOD MAPPED SPECTRAL RESPONSE ACCELERATION, S_s	0.063 g	
		4. 1-SEC PERIOD MAPPED SPECTRAL RESPONSE ACCELERATION, S_1	0.035 g	
		5. SITE CLASS	B	
		6. SHORT PERIOD SPECTRAL RESPONSE COEFFICIENT, S_{DS}	0.042 g	
		7. 1-SEC PERIOD SPECTRAL RESPONSE COEFFICIENT, S_{D1}	0.023 g	
		8. SEISMIC DESIGN CATEGORY	A	
		9. RESPONSE MODIFICATION FACTOR, R	2	
		10. SYSTEM OVERSTRENGTH FACTOR, Ω	2.5	
		11. DEFLECTION AMPLIFICATION FACTOR, Cd	1.75	
		12. SEISMIC RESPONSE COEFFICIENT, Cs	0.032	
		13. DESIGN BASE SHEAR, V	0.032W	
		14. BASIC SEISMIC FORCE-RESISTING SYSTEM	ORDINARY REINFORCED MASONRY SHEAR WALLS	
		15. ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE PROCEDURE	
4.	DEFLECTION LIMITS			
	A.	ROOF MEMBERS		
		1. LIVE LOAD MAXIMUM ALLOWABLE DEFLECTION	L/360	
		2. TOTAL LOAD MAXIMUM ALLOWABLE DEFLECTION	L/240	
	B.	FLOOR MEMBERS		
		1. LIVE LOAD MAXIMUM ALLOWABLE DEFLECTION	L/360	
		2. TOTAL LOAD MAXIMUM ALLOWABLE DEFLECTION	L/240	
	C.	MEMBERS SUPPORTING MASONRY		
		1. LIVE LOAD MAXIMUM ALLOWABLE DEFLECTION	L/600 or 0.3-INCH	
	D.	BUILDING FRAME		
		1. MAXIMUM ALLOWABLE STORY DRIFT	H/500 (TOTAL BUILDING HEIGHT)	

1 DESIGN LOADS
12" = 1'-0"

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
GENERAL NOTES ALTERNATE 1

DATE:
05/23/2019

JOB NO.:
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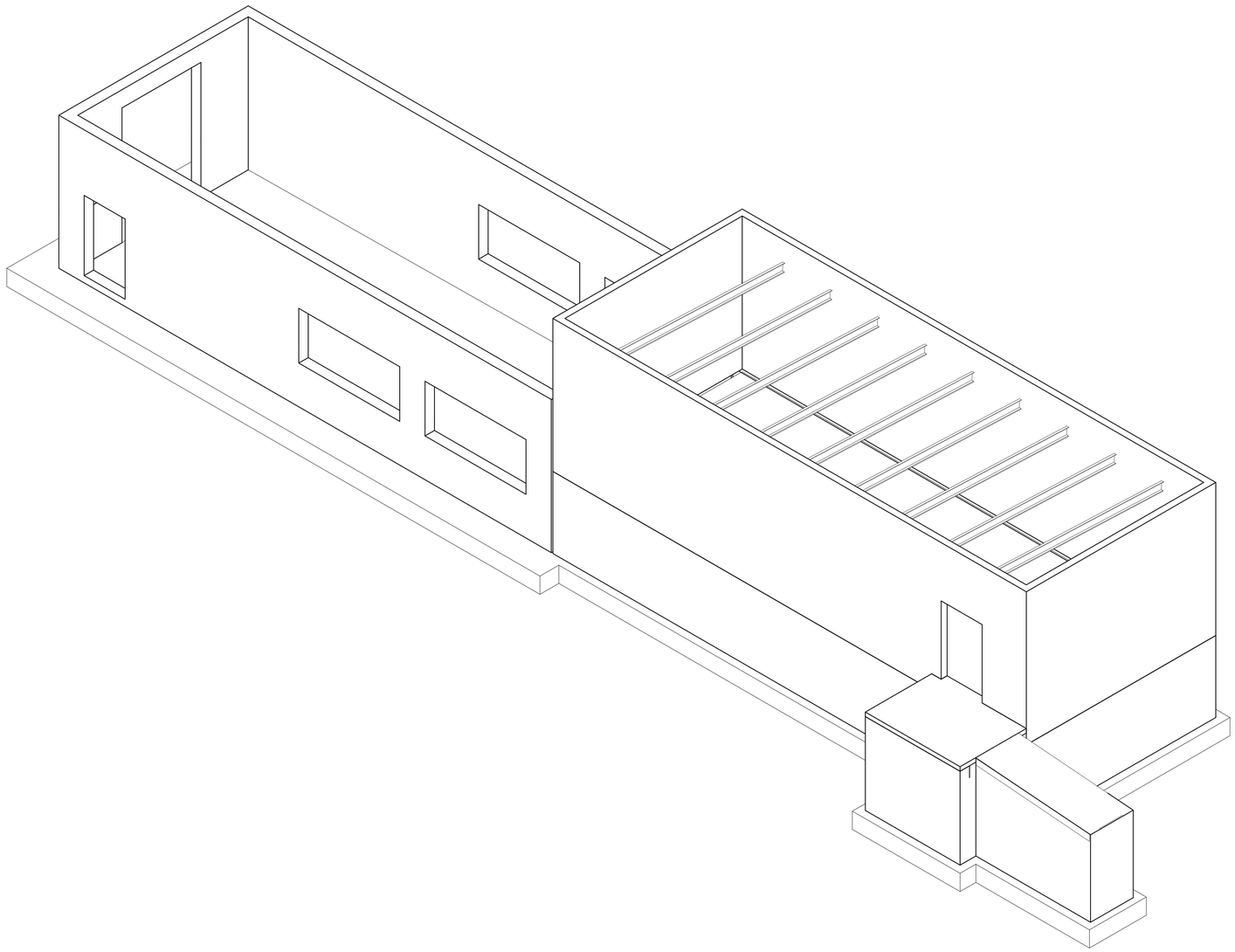
S0.02A



1 OVERALL 3D VIEW

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OVERALL 3D VIEW

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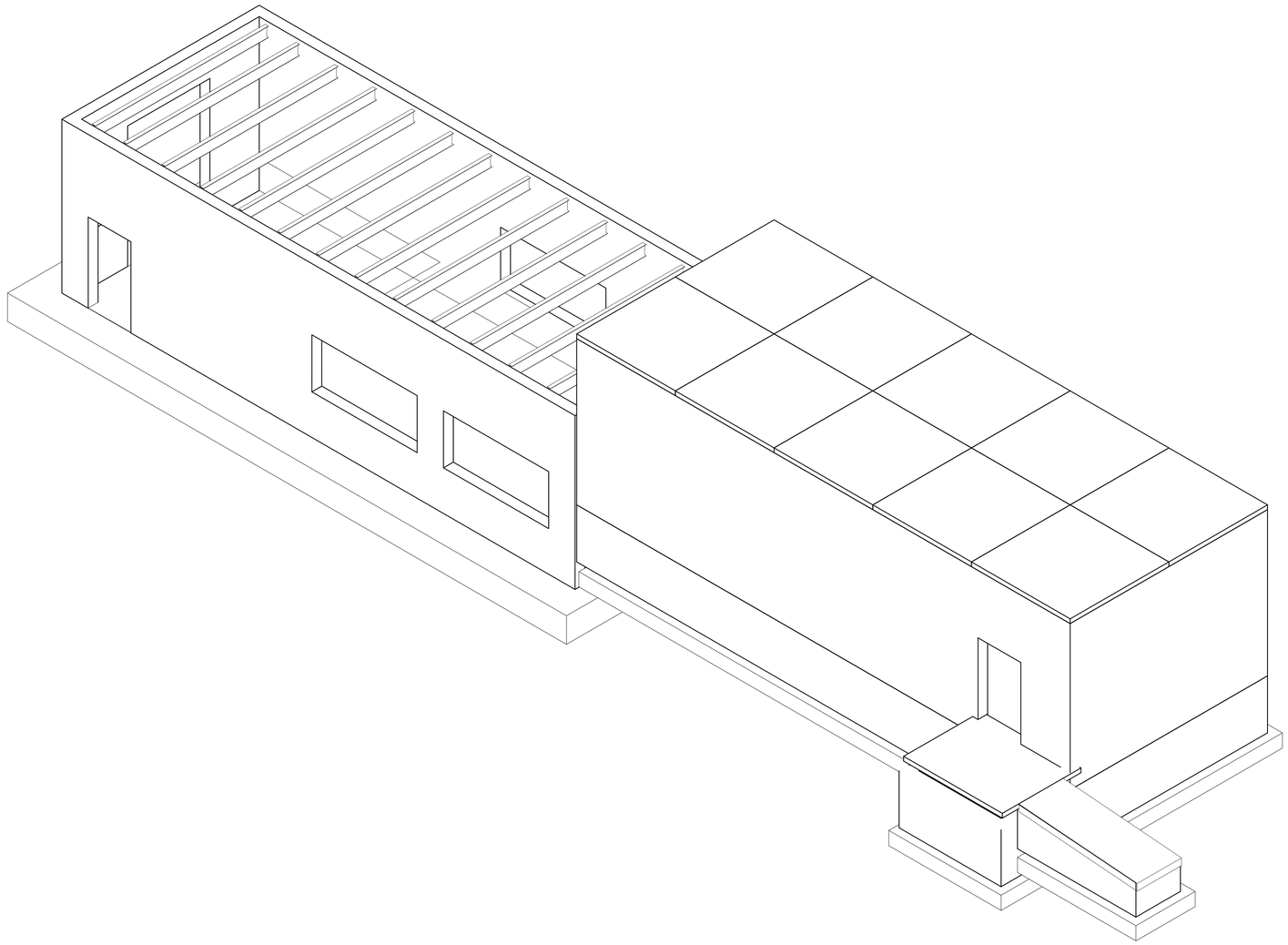
SHEET:
S0.03



1 OVERALL 3D VIEW

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SHEET CONTENTS:
OVERALL 3D VIEW ALTERNATE 1

DATE:
05/23/2019

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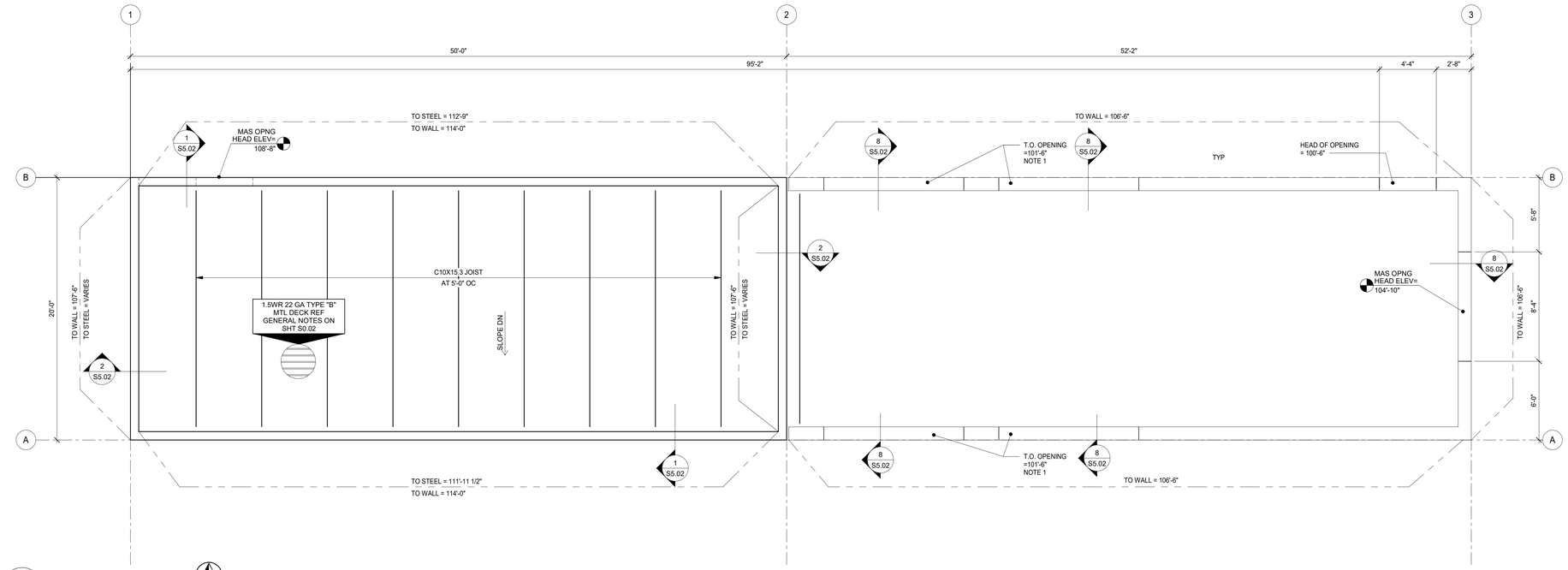
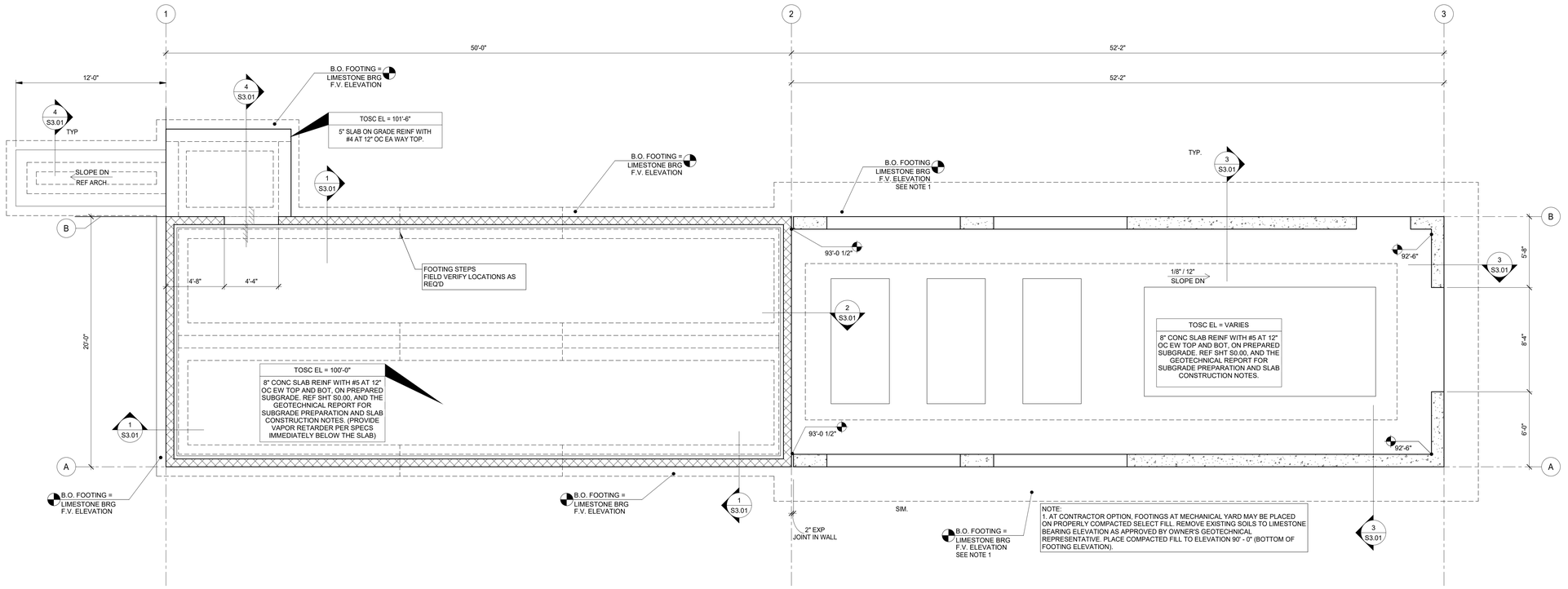


2 ROOF PLAN
1/4" = 1'-0"

NORTH



1 FOUNDATION PLAN
1/4" = 1'-0"

NORTH

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SHEET CONTENTS:
FOUNDATION PLAN AND ROOF PLAN

DATE:
05/23/2019

JOB NO.:
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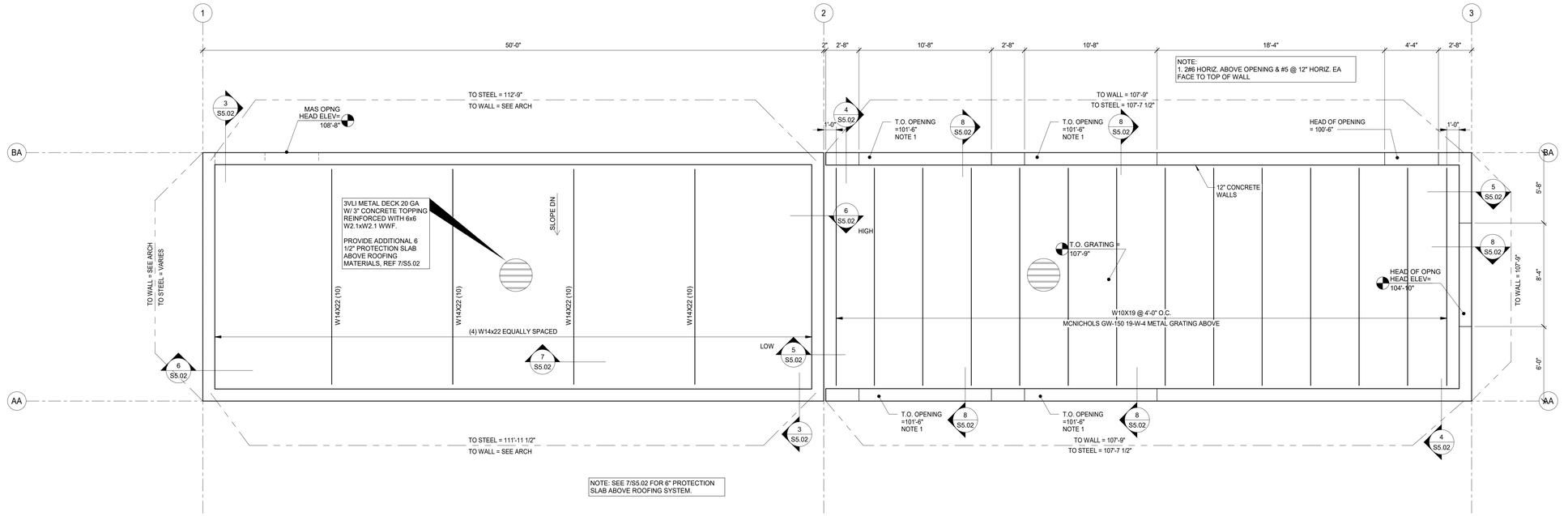
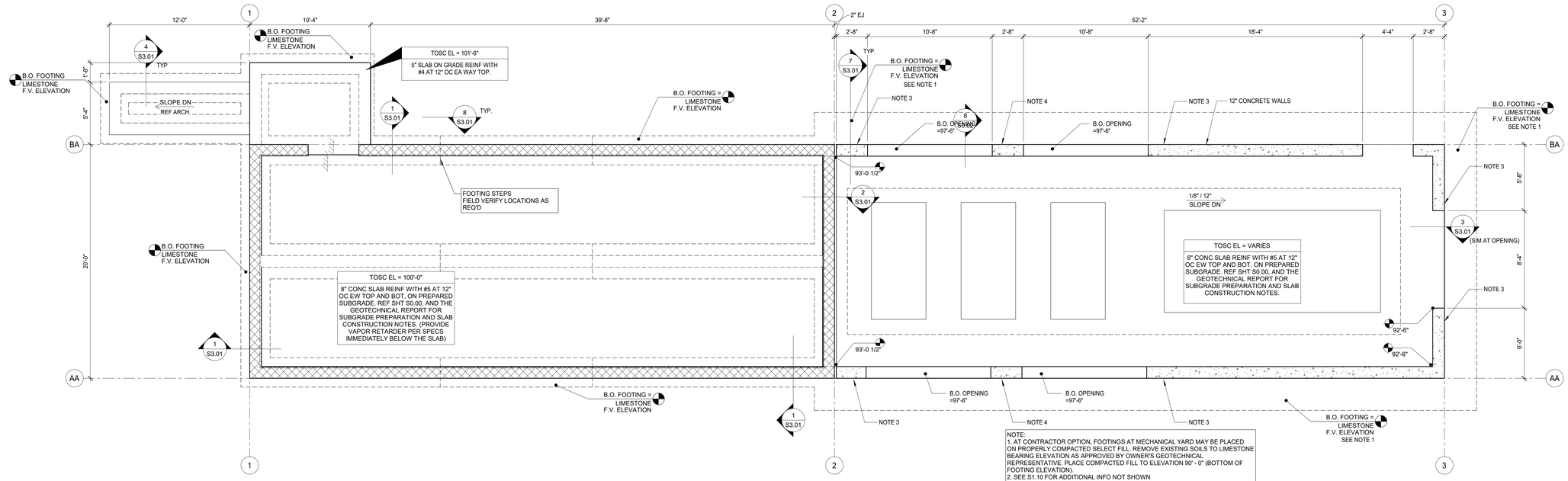
SHEET:
S1.10



2 ROOF PLAN
1/4" = 1'-0"



1 FOUNDATION PLAN
1/4" = 1'-0"

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

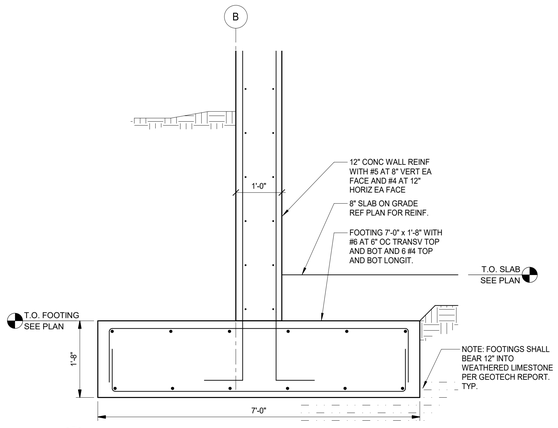
SHEET CONTENTS:
FOUNDATION PLAN AND ROOF PLAN ALTERNATE 1

DATE:
05/23/2019

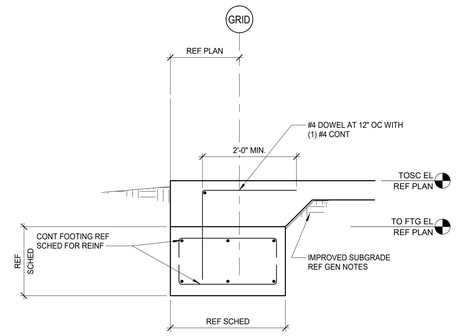
JOB NO.:
18465.01

SHEET:
S1.10A

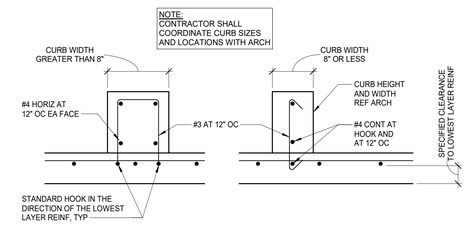
8 TYP FOOTING STEP
3/4" = 1'-0"



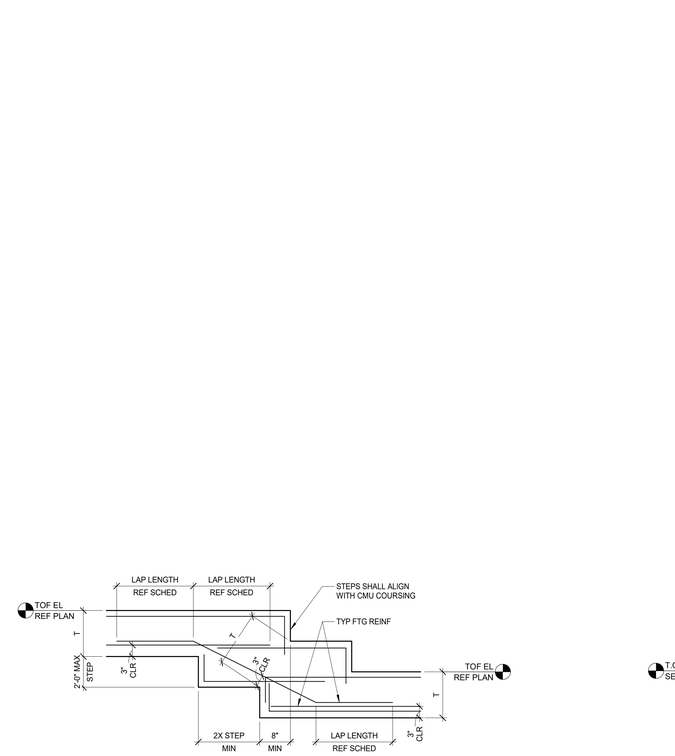
7 ALTERNATE 1 SECTION
3/4" = 1'-0"



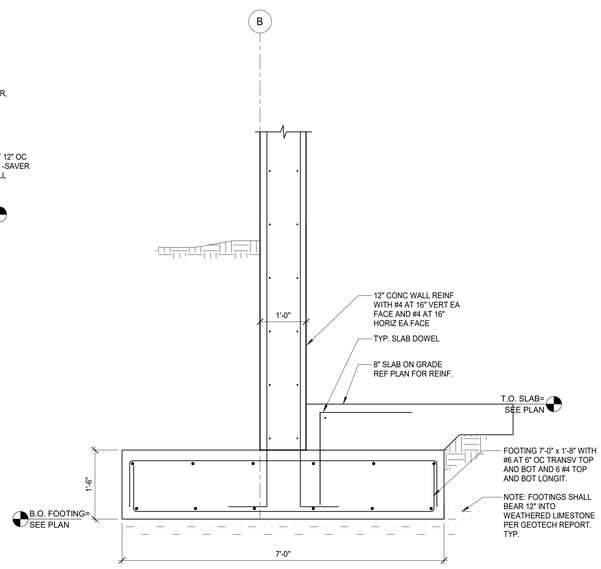
6 TYP DOWEL DETAIL
3/4" = 1'-0"



5 TYPICAL CURB AT SLAB
1" = 1'-0"



4 SECTION
3/4" = 1'-0"



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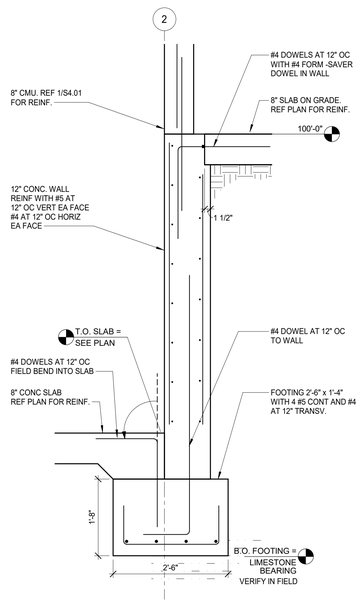
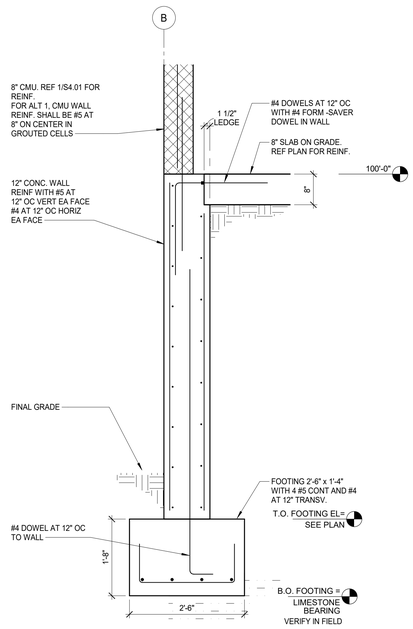
3/4" = 1'-0"



2 SECTION
3/4" = 1'-0"



1 SECTION
3/4" = 1'-0"

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PROJECT:
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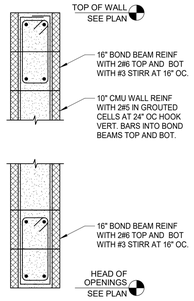
SHEET CONTENTS:
STRUCTURAL CONCRETE DETAILS

DATE:
05/23/2019

JOB NO.
18465.01

SHEET:
S3.01



5 BOND BEAM ABOVE OPENING
1" = 1'-0"

NOTE: TYPICAL CMU WALL REINFORCING SCHEDULE DOES NOT APPLY FOR ALTERNATE 1

STRUCTURAL CMU WALL VERTICAL REINFORCING SCHEDULE

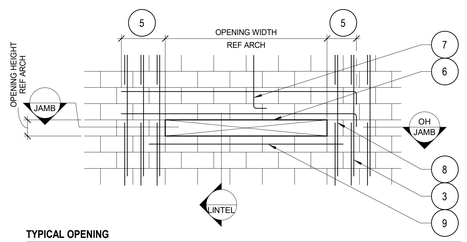
WALL DESIGNATION	MAX UNBRACED WALL HEIGHT	EXTERIOR WALL VERTICAL REINF	INTERIOR WALL VERTICAL REINF
8" CMU	15'-0"	#6 AT 24" OC	#6 AT 32" OC
	18'-0"	#6 AT 16" OC	#6 AT 24" OC
12" CMU	21'-0"	#6 AT 24" OC EA. FACE	#6 AT 16" OC
	33'-0"	#6 AT 16" OC EA. FACE	#6 AT 16" OC

1. THIS SCHEDULE ONLY APPLIES TO CMU WALLS SHOWN AND DESIGNATED ON THE STRUCTURAL FRAMING PLANS. CMU WALLS NOT SHOWN ON THE STRUCTURAL FRAMING PLANS ARE NOT PART OF THE STRUCTURAL FRAME AND ARE CONSIDERED NON-STRUCTURAL CMU.
2. REFER TO THE "NON-STRUCTURAL CMU WALL VERTICAL REINFORCING SCHEDULE" ON THIS SHEET FOR MINIMUM REQUIRED REINFORCING AT ARCHITECTURAL (NON STRUCTURAL) CMU WALLS. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
3. UNLESS NOTED OTHERWISE, REFER TO THE SCHEDULE ABOVE FOR VERTICAL WALL REINFORCING REQUIREMENTS AT ALL STRUCTURAL CMU WALLS. REFER TO "TYPICAL WALL REINFORCING DIAGRAM" FOR ADDITIONAL INFORMATION.
4. THE STRUCTURAL MASONRY SHOWN ON THE PLANS IS PART OF THE LATERAL LOAD RESISTING SYSTEM OF THE BUILDING. THE STRUCTURAL DETAILS, INCLUDING CLIP ANGLES, DOWELS AND ADDITIONAL SECONDARY FRAMING MEMBERS, ETC., SHOWN ARE CRITICAL TO THE LATERAL PERFORMANCE OF THE BUILDING. THE TEMPORARY STEEL FRAME BRACING PROVIDED DURING CONSTRUCTION SHALL NOT BE REMOVED UNTIL ALL STRUCTURAL LATERAL BRACING SYSTEMS (INCLUDING STRUCTURAL MASONRY WALLS) HAVE BEEN INSTALLED AND CONNECTED TO THE STEEL FRAMING.
5. THE FIRST (3) CELLS AT CORNERS (IN EA DIRECTION), ENDS OF WALLS AND EACH SIDE OF THE CONTROL JOINTS SHALL BE REINFORCED WITH THE SAME SIZE AND NUMBER OF REINFORCING BARS AS SPECIFIED FOR THE OTHER REINFORCED CELLS IN THE WALL AND GROUTED FULL.
6. FOR REINFORCED CMU WALLS AT OPENINGS, PROVIDE EXTRA REINFORCED GROUTED FULL HEIGHT CONSECUTIVE CELLS EACH SIDE OF THE OPENING EQUAL TO ONE HALF THE TOTAL NUMBER OF THE CELLS INTERRUPTED BY THE OPENING. REINFORCE EACH CELL WITH THE SAME SIZE AND NUMBER OF BARS AS SPECIFIED FOR THE INTERRUPTED CELLS. FOR UNREINFORCED CMU WALLS, PROVIDE 1 #5, 1 #6 OR 2 #6 IN 6", 8" OR 12" CMU WALLS IN EACH GROUTED CELL RESPECTIVELY. PROVIDE A MINIMUM OF (2) REINFORCED GROUTED CELLS EACH SIDE OF OPENING. REFER TO TYPICAL CMU WALL OPENING DIAGRAM AND SCHEDULE FOR ADDITIONAL INFORMATION.
7. HOLD VERTICAL REINFORCING IN POSITION AT TOP AND BOTTOM AND AT 8'-0" OC MAXIMUM.
8. REFER TO GENERAL NOTES, SPECIFICATIONS AND SECTIONS/DETAILS FOR INFORMATION NOT SHOWN.
9. VERTICAL BARS MAY BE SPLICED IN 8'-0" (+ or -) LENGTHS. SPLICES LOCATED IN ADJACENT CELLS SHALL BE STAGGERED SUCH THAT NOT MORE THAN 50 PERCENT OF THE BARS ARE SPLICED AT THE SAME LOCATION.

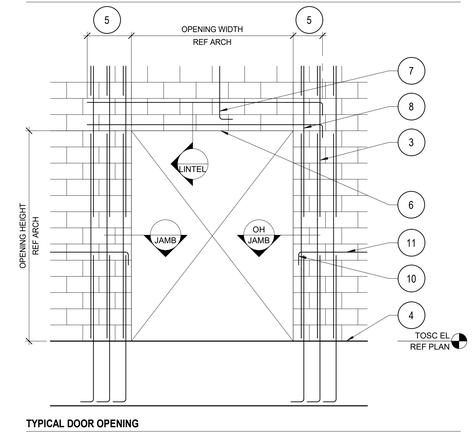
1A TYPICAL STRUCTURAL CMU WALL VERTICAL REINFORCING SCHEDULE
3/4" = 1'-0"

TYPICAL NON-LOAD BEARING CMU LINTEL SCHEDULE				
WIDTH (W)	DEPTH (D)	CLEAR SPAN	REINF	STIRRUP
6" or 8"	8"	UP TO 5'-0"	(2) #4 BOT	
6" or 8"	16"	UP TO 10'-0"	(2) #6 T&B	#3 AT 12" OC

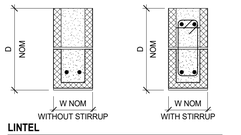
LOAD BEARING CMU LINTEL SCHEDULE				
WIDTH (W)	DEPTH (D)	CLEAR SPAN	REINF	STIRRUP
8"	16"	4'-4"	(2) #6 T AND B	#3 AT 12" OC



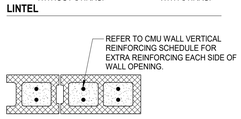
TYPICAL OPENING



TYPICAL DOOR OPENING



LINTEL



JAMB

NOTES:
1. REFER TO ARCH'L AND MECH'L DRAWINGS FOR SIZE AND LOCATION OF OPENINGS.
2. REFER TO SCHEDULES FOR LINTEL AND JAMB REINFORCING UNLESS DETAILED OTHERWISE.
3. SPLICES IN VERT REINF REF CMU WALL REINF DIAGRAM.
4. CMU WALL STARTS ABOVE FLOOR.
5. EXTEND GROUTED LINTEL A MINIMUM OF 2'-0" BEYOND FACE OF OPENING EACH SIDE FOR STRAIGHT LINTEL REINF AND 1'-0" FOR LINTEL REINF WITH STANDARD ACI HOOK.
6. USE LINTEL BLOCKS ONLY FOR BOTTOM COURSE OF LINTEL BEAMS OVER OPENING. LINTEL SHALL REMAIN SHORED UNTIL MASONRY CONSTRUCTION ABOVE HAS REACHED 100% OF THE SPECIFIED 28 DAY COMPRESSIVE STRENGTH.
7. CONTINUE VERT WALL REINF OVER OPENING. ANCHOR VERT REINF INTO LINTEL BEAM WITH STANDARD ACI 90° HOOK.
8. ALL VERT BARS AT DOOR JAMBS TO BE FULL HEIGHT.
9. #5 SILL REINF. SOLID GROUT SILL.
10. WHERE HORIZONTAL REINF IS TERMINATED BY OPENING OR CONTROL JOINT PROVIDE STANDARD ACI HOOK WITH VERT WALL REINF IN THE END CELL.
11. CONTINUOUS BOND BEAM REF CMU WALL REINF DIAGRAM.

4 TYPICAL CMU WALL OPENING DIAGRAM AND SCHEDULE
1" = 1'-0"

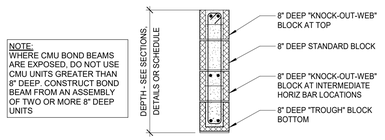
TENSION LAP SPLICE SCHEDULE FOR STEEL REINFORCING IN CMU

BAR SIZE	LAP SPLICE LENGTH (INCHES)
3	19
4	34
5	45
6	54
7	63
8	72
9	82

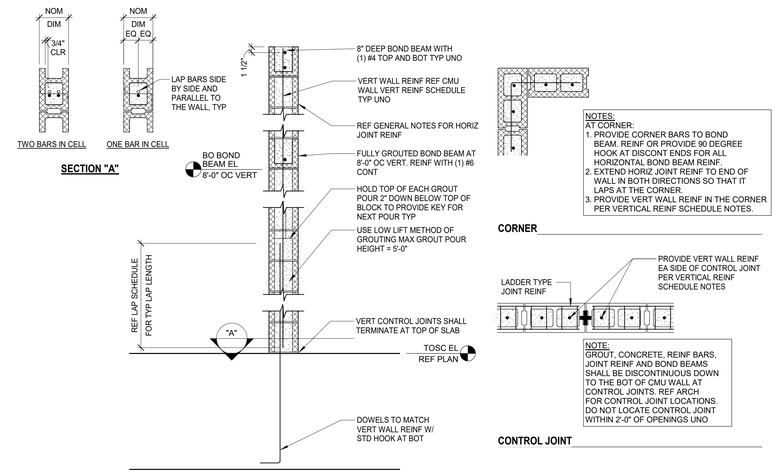
NOTES:
1. FOR GRADE 60 NON-EPOXY COATED REINFORCING.
2. FOR EPOXY COATED REINFORCING, INCREASE TABULATED LENGTHS BY 50%.

3 TENSION LAP SPLICE SCHEDULE FOR STEEL REINFORCING IN CMU
12" = 1'-0"

NOTE:
WHERE CMU BOND BEAMS ARE EXPOSED, DO NOT USE CMU UNITS GREATER THAN 8" DEEP. CONSTRUCT BOND BEAM FROM AN ASSEMBLY OF TWO OR MORE 8" DEEP UNITS



2 TYPICAL BOND BEAM CONSTRUCTION AT ALL EXPOSED CMU LOCATIONS
3/4" = 1'-0"



1 TYPICAL CMU WALL REINFORCING DIAGRAM
3/4" = 1'-0"

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PROJECT:
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SHEET CONTENTS:
TYPICAL CMU DETAILS AND SCHEDULES

DATE:
05/23/2019

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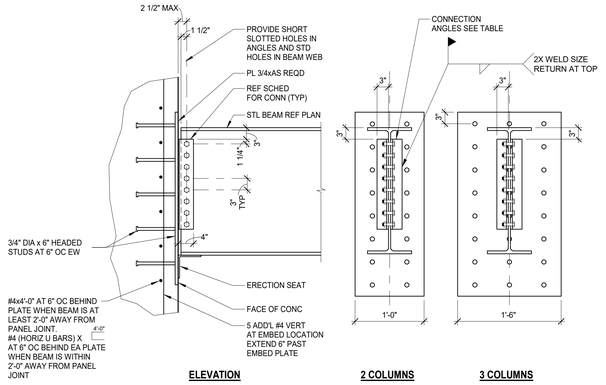
SHEET:
S4.01



STEEL BEAM TO CONCRETE CONNECTION SCHEDULE

BEAM SIZE	ANGLE SIZE	NUMBER OF 3/4" A325N BOLTS	WELD SIZE	HEADED STUDS (ROWS X COLUMNS)	MAX CAPACITY (KIPS)
W8	L4x3x5/16x0'-5 1/2"	2	1/4	2x2	11
W10	L4x3x5/16x0'-5 1/2"	2	1/4	2x2	14
W12	L4x3x5/16x0'-8 1/2"	3	1/4	3x2	24
W14	L4x3x5/16x0'-8 1/2"	3	1/4	4x2 OR 3x3	28
W16	L4x3x5/16x0'-11 1/2"	4	1/4	4x3	33
W18	L4x3x5/16x0'-11 1/2"	4	1/4	5x3	49
W21	L4x3x5/16x1'-2 1/2"	5	1/4	6x3	61
W24	L4x3x5/16x1'-5 1/2"	6	1/4	6x3	85
W27	L4x3x5/16x1'-5 1/2"	6	1/4	7x3	100
W30	L4x3x5/16x1'-8 1/2"	7	1/4	7x3	120
W33	L4x3x5/16x1'-11 1/2"	8	1/4	8x3	143
W36	L4x3x5/16x2'-2 1/2"	9	1/4	9x3	161

NOTES:

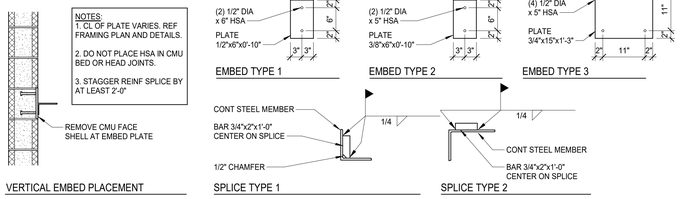
1. REFER TO TYPICAL SIMPLE SHEAR STEEL BEAM CONNECTIONS DETAIL FOR CONNECTION CAPACITY AND ADDITIONAL INFORMATION.
2. STUDS SHALL NOT BE LOCATED CLOSER THAN 5" TO ANY CONCRETE EDGES. CONTACT ENGINEER IF THIS IS NOT POSSIBLE.
3. TABULATED CONNECTION CAPACITIES ARE SERVICE-LOAD LEVEL (ASD), AND ARE BASED ON GRADE 50 BEAMS, 3/4" DIAMETER A325N BOLTS (BEARING TYPE), E70XX ELECTRODES, AND A36 ANGLES.

3 TYPICAL STEEL BEAM TO CONCRETE CONNECTION

3/4" = 1'-0"

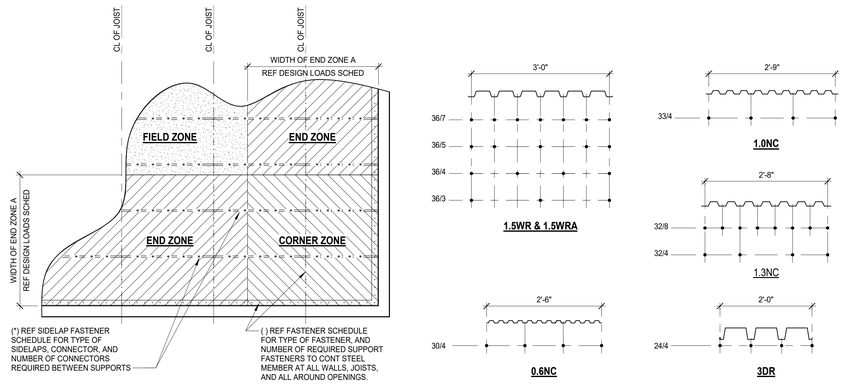
CONT DECK CHORD ANGLE, REINF AND EMBED SCHEDULE

LOCATION	EMBED TYPE	EMBED SPACING	CONTINUOUS STEEL CHORD MEMBER SIZE	CHORD REINF	SPLICE TYPE	NOTES
TYP	2	48"	L4x4x1/4	-	1	



1 DIAPHRAGM CHORD SCHEDULE AND DETAILS

3/4" = 1'-0"



FASTENER SCHEDULE

DECK TYPE	GAUGE	ZONE	(o) DECK TO CONTINUOUS MEMBER CONNECTOR TYPE	(*) SIDE LAP FASTENERS
1.5WR	22	CORNER ZONE	5/8" DIAMETER PUDDLE WELDS 36/7 PATTERN	(6) #10 TEK SCREWS AT (7) EQUAL SPACES
		END ZONE	5/8" DIAMETER PUDDLE WELDS 36/7 PATTERN	(6) #10 TEK SCREWS AT (7) EQUAL SPACES
		FIELD ZONE	5/8" DIAMETER PUDDLE WELDS 36/7 PATTERN	(6) #10 TEK SCREWS AT (7) EQUAL SPACES

2 ROOF DIAPHRAGM CONNECTION DIAGRAM AND SCHEDULE

3/4" = 1'-0"

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SHEET CONTENTS:
TYPICAL CONNECTION DETAILS

DATE:
05/23/2019

JOB NO.
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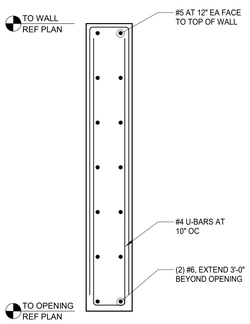
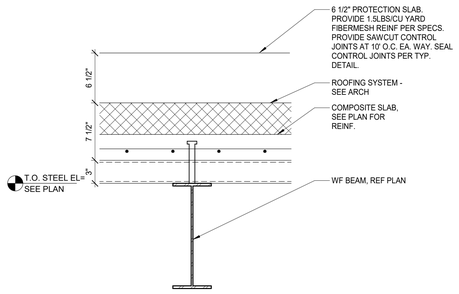
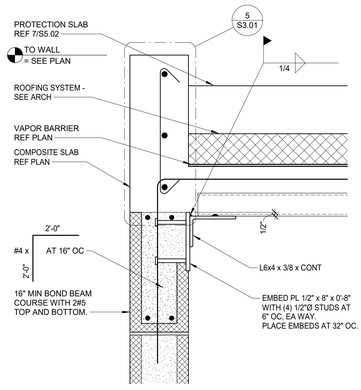
SHEET:
S5.01



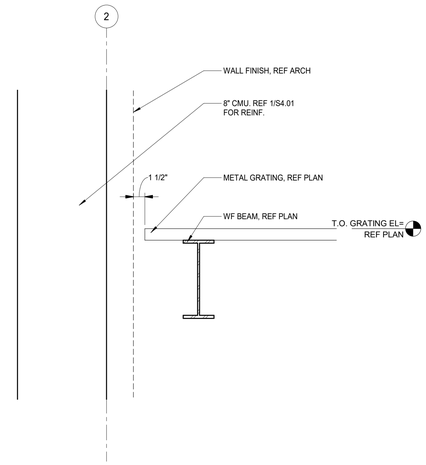
8 OPENING REINFORCING
3/4" = 1'-0"



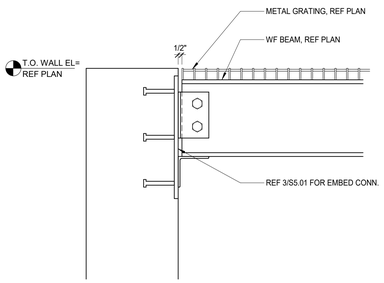
7 ALTERNATE 1 ROOF SECTION
1 1/2" = 1'-0"



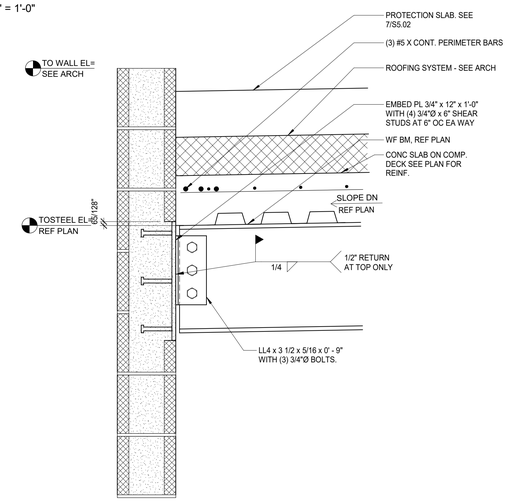
6 ALTERNATE 1 EMBED PLATE AT WALL
1 1/2" = 1'-0"



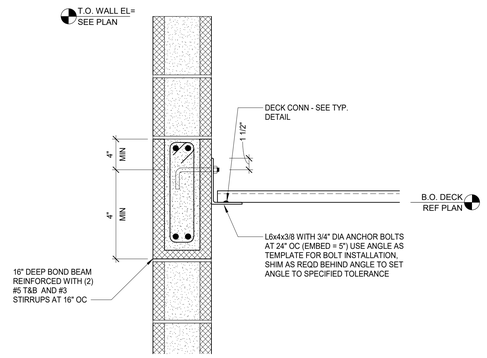
5 ALTERNATE 1 SECTION AT SHARED WALL
1 1/2" = 1'-0"



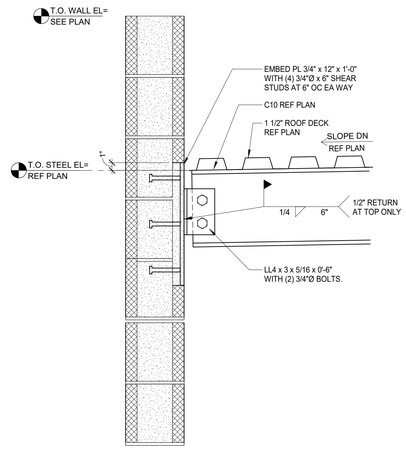
4 ALTERNATE 1 STEEL BEAM TO
CONCRETE WALL CONNECTION
1 1/2" = 1'-0"



3 ALTERNATE 1 STEEL BEAM TO
MASONRY WALL CONNECTION
1 1/2" = 1'-0"



2 DECK BEARING ON MASONRY WALL
1 1/2" = 1'-0"



1 STEEL BEAM TO
MASONRY WALL CONNECTION
1 1/2" = 1'-0"

DANIEL GRIEG GRANT
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05/23/19
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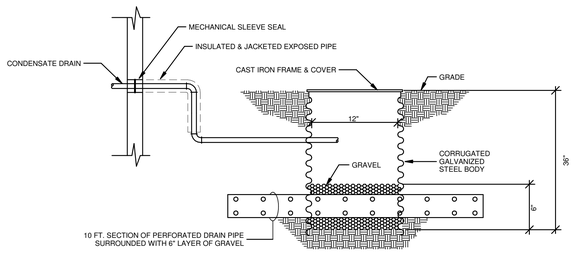
PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
STEEL ROOF FRAMING SECTIONS AND DETAILS

DATE:
05/23/2019

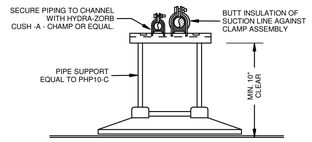
JOB NO.:
18465.01

SHEET:
S5.02



DRY WELL DETAIL

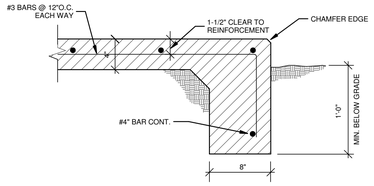
NO SCALE



REFRIGERANT PIPING SUPPORT DETAIL

NO SCALE

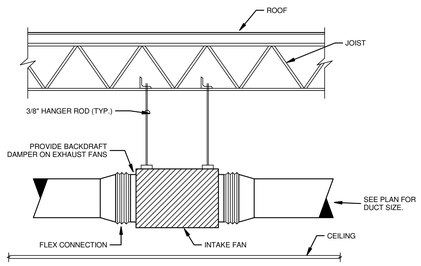
NOTE:
1. MULTIPLE LINE SETS MAY BE SUPPORTED ON ONE SUPPORT AS NEEDED.
2. FOR ADDITIONAL HEIGHT, UNISTRUT AND SUPPORT SYSTEMS SHALL BE USED.



EQUIPMENT PAD DETAIL

NO SCALE

NOTE:
1. PERIMETER FOOTING IS NOT REQUIRED WHEN PAD IS POURED ON TOP OF EXISTING CONTRETE.



INLINE EXHAUST FAN MOUNTING DETAIL

NO SCALE

MECHANICAL ABBREVIATIONS

ABBREV	DESCRIPTION
AAV	AUTOMATIC AIR VENT ASSEMBLY
ABV	ABOVE
A/C	AIR CONDITIONED
AD	ACCESS DOOR
AF	AIR FLOW
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
AMCA	AIR MOVING AND CONDITIONING ASSOCIATION, INC.
AP	ACCESS PANEL
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
ARI	AIR CONDITIONING & REFRIGERATION INSTITUTE
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AUX	AUXILIARY
B	BOILER
BCU	BLOWER COIL UNIT
BDD	BACK DRAFT DAMPER
BFC	BELOW FINISHED CEILING
BFF	BELOW FINISHED FLOOR
BFG	BELOW FINISHED GRADE
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BI	BACKWARD INCLINED
BLDG	BUILDING
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BSMT	BASEMENT
BTU	BRITISH THERMAL UNIT
CD	CONDENSATE DRAIN LINE OR CONTROL DAMPER
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CHP	CHILLED WATER PUMP
CHR	CHILLED WATER RETURN
CHS	CHILLED WATER SUPPLY
CIRC	CIRCULATING
CL	CENTER LINE
CLG	CEILING
CM	CONSTRUCTION MANAGER
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
CONC	CONCRETE
COND	CONDENSATE
CONN	CONNECTION
CONT	CONTINUATION
CR	CONDENSATE RETURN
CRAC	COMPUTER ROOM AIR CONDITIONER
CRAH	COMPUTER ROOM AIR HANDLER
CT	COOLING TOWER
CWR	CONDENSING WATER RETURN
CWS	CONDENSING WATER SUPPLY
CU	CONDENSING UNIT
CV	CONTROL VALVE
CW	DOMESTIC COLD WATER
D	DRAIN
DB	DRY BULB
DEG	DEGREES
DG	DOOR GRILLE
DIA	DIAMETER
DIFF	DIFFUSER
DMPR	DAMPER
DN	DOWN
DWG	DRAWING
DX	DIRECT EXPANSION
EA	EACH OR EXHAUST AIR
EAG	EXHAUST GRILLE
EAT	ENTERING AIR TEMPERATURE
EDH	ELECTRIC DUCT HEATER
EF	EXHAUST FAN
EH	EXHAUST HOOD
ELEC	ELECTRICAL
ELEV	ELEVATION
EMERG	EMERGENCY
ENT	ENTERING
EOM	END OF MAIN
EQUIP	EQUIPMENT
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
EVAP	EVAPORATOR
EX	EXISTING
EXH	EXHAUST
F	DEGREES FAHRENHEIT OR FIRE LINE
°F	DEGREES FAHRENHEIT
FCU	FAN COIL UNIT OR FURNACE & COIL UNIT
FD	FIRE DAMPER
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FM	FACTORY MUTUAL
FO	FLAT OVAL DUCT
FPB	FAN-POWERED BOX
FPM	FOOT PER MINUTE
FS	FLOW SWITCH
FT	FEET, FOOT
GAL	GALLON
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GPH	GALLON PER HOUR
GPM	GALLON PER MINUTE
H	HIGH, HEIGHT
HB	HOSE BIBB
HD	HEAD IN FEET
HOA	HAND-OFF-AUTO
HP	HORSE POWER OR HEAT PUMP
HR	HOUR
HW	HEATING / VENTILATING / AIR CONDITIONING
HWP	DOMESTIC HOT WATER
HVAC	HEATING WATER PUMP
HZ	HERTZ

ABBREV	DESCRIPTION
ID	INSIDE DIAMETER
IE	INVERT ELEVATION (FLOW LINE)
IN	INCHES
INSUL	INSULATION
IN WG	INCHES OF WATER
KW	KILOWATT(S)
L	LONG, LENGTH
LAT	LEAVING AIR TEMPERATURE
LAV	LAV OR LAVATORY
LB	POUND
LIN FT	LINEAL FOOT
LPG	LIQUID PROPANE GAS
LRA	LOCKED ROTOR AMPS
LVR	LOUVER
MAX	MAXIMUM
MBD	MANUAL BALANCING DAMPER
MBH	THOUSAND BTU / HR
MECH	MECHANICAL
MIN	MINIMUM
MS	MOTOR STARTER
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAH	OUTSIDE AIR INTAKE HOOD
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OD	OUTSIDE DIAMETER
PBD	PARALLEL BLADE DAMPER
PCHP	PRIMARY CHILLED WATER PUMP
PCHR	PRIMARY CHILLED WATER RETURN
PCHS	PRIMARY CHILLED WATER SUPPLY
PD	PRESSURE DROP
PH	PHASE
PHL	PRESSURE HIGH LIMIT
PLUMB	PLUMBING
PNL	PANEL
PPM	PARTS PER MILLION
PRESS	PRESSURE
PRV	POWER ROOF VENTILATOR
PRV	PRESSURE REDUCING VALVE
PSIG	POUND PER SQUARE INCH. (GAUGE)
QTY	QUANTITY
RA	RETURN AIR
RAG	RETURN AIR GRILLE
RAH	RELIEF AIR HOOD
RE	REFER
REQ'D	REQUIRED
REV	REVISED OR REVISIONS
RH	RELATIVE HUMIDITY
RHC	REHEAT COIL
RM	ROOM
RPM	REVOLUTION PER MINUTE
RTU	ROOF TOP UNIT
PRV	POWER ROOF VENTILATOR
SA	SUPPLY AIR
SAF	SUPPLY FAN
SCH	SCHEDULE
SCHP	SECONDARY CHILLED WATER PUMP
SD	SMOKE DAMPER
SEC	SECOND
SECT	SECTION
SF	SQUARE FOOT
SHT	SHEET
SQ	SQUARE
SS	SERVICE SINK, STAINLESS STEEL OR SANITARY SEWER
STD	STANDARD
STM	STEAM
SURF	SURFACE
SUSP	SUSPEND OR SUSPENDED
SW	SOFTENED WATER
SYS	SYSTEM
TEMP	TEMPERATURE
THL	TEMPERATURE HIGH LIMIT
TLL	TEMPERATURE LOW LIMIT
TP	TOTAL PRESSURE
TSP	TOTAL STATIC PRESSURE
TSTAT	THERMOSTAT
TU	TERMINAL UNIT
TXV	THERMOSTATIC EXPANSION VALVE
TYP	TYPICAL
UF	UNDERFLOOR
UG	UNDERGROUND
UH	UNIT HEATER
UNO	UNLESS OTHERWISE NOTED
V	VOLT(S)
VAV	VARIABLE AIR VOLUME
VB	VALVE BOX OR VACUUM BREAKER
VEL	VELOCITY
VENT	VENTILATE
VERT	VERTICAL
VF	VENTILATION FAN
VOL	VOLUME
VTR	VENT THRU ROOF
W	WASTE OR WIDE, WIDTH
W/	WITH
W/O	WITHOUT
WB	WET BULB
WG	WATER GAUGE
WT	WEIGHT
△	DELTA
Ø	PHASE OR ROUND

MECHANICAL LEGEND

GENERAL

SYMBOL	DESCRIPTION
	EXISTING COMPONENT TO REMAIN
	EXISTING COMPONENT TO BE REMOVED
	DROP
	RISE
	RISE OFF TOP
	DROP OFF BOTTOM
	BRANCH OFF TOP
	BRANCH OFF BOTTOM
	BRANCH OFF SIDE
	CAP
	BLIND FLANGE
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	SLEEVE
	GUIDE
	ANCHOR
	FLOW DIRECTION
	GRADE DOWNWARD
	CONNECT TO EXISTING

VALVES & ACCESSORIES

SYMBOL	DESCRIPTION
	BALL VALVE
	BUTTERFLY VALVE
	MOTORIZED BUTTERFLY VALVE
	GATE VALVE
	GAS COCK
	GLOBE VALVE
	CHECK VALVE
	PRESSURE REDUCING VALVE
	MOTORIZED 2-WAY CONTROL VALVE
	MOTORIZED 3-WAY CONTROL VALVE
	THERMOSTATIC MIXING VALVE
	SOLENOID VALVE
	VALVE BOX
	WATER METER
	BACKFLOW PREVENTER
	BALANCING VALVE
	UNION
	STRAINER W/ BLOW DOWN
	GAG PRESSURE REGULATOR
	THERMOMETER
	PRESSURE GAUGE W/ GAUGE COCK
	PETE'S PLUG
FS	FLOW SWITCH
PS	PRESSURE SWITCH
	AQUASTAT
AAV	AUTO AIR VENT
	VACUUM RELIEF VALVE
	TEMPERATURE & PRESSURE RELIEF
	PRESSURE RELIEF VALVE
	FLEXIBLE CONNECTION
	FLOW MEASURING DEVICE
	TEST WELL
EJ	EXPANSION JOINT

COOLING PIPING

SYMBOL	DESCRIPTION
—CHR—	CHILLED WATER RETURN
—CHS—	CHILLED WATER SUPPLY
—PCHR—	PRIMARY CHILLED WATER RETURN
—PCHS—	PRIMARY CHILLED WATER SUPPLY
—CWR—	CONDENSING WATER RETURN
—CWS—	CONDENSING CHILLED WATER SUPPLY
—RL—	REFRIGERANT LIQUID
—RS—	REFRIGERANT SUCTION
—RHG—	REFRIGERANT HOT GAS
—•—	MAKEUP WATER
—D—	CONDENSATE DRAIN

MISC. PIPING

SYMBOL	DESCRIPTION
—A—	COMPRESSED AIR
—IA—	INSTRUMENT AIR
—G—	NATURAL GAS - LOW PRESSURE (<1 PSI)
—MG—	NATURAL GAS - MED. PRESSURE (>1 PSI)
—LP—	LIQUID PROPANE GAS

HEATING PIPING

SYMBOL	DESCRIPTION
—HWS—	HEATING WATER SUPPLY
—HWR—	HEATING WATER RETURN
— 5# —	STEAM WITH PRESSURE INDICATED
— / —	CONDENSATE RETURN - LOW PRESSURE
— // —	CONDENSATE RETURN - HIGH PRESSURE
— O —	PUMPED CONDENSATE RETURN
—BFW—	BOILER FEED WATER
	BUCKET TRAP
	FLOAT & THERMOSTATIC TRAP

CONTROLS

SYMBOL	DESCRIPTION
T	THERMOSTAT
H	HUMIDISTAT
S or T	TEMPERATURE SENSOR
H	HUMIDITY SENSOR
P	PRESSURE SENSOR
DPS or DPT	DIFFERENTIAL PRESSURE SENSOR

DUCTWORK & ACCESSORIES

SYMBOL	DESCRIPTION
12X10	RECTANGULAR DUCT (FIRST DIM VISIBLE)
12Ø	ROUND DUCT (FIRST DIM VISIBLE)
12/10	FLAT OVAL DUCT (FIRST DIM VISIBLE)
	RECTANGULAR SUPPLY DUCT TURNED UP
	RECTANGULAR RETURN OR EXHAUST DUCT TURNED UP
	RECTANGULAR SUPPLY DUCT TURNED DOWN
	RECTANGULAR RETURN OR EXHAUST DUCT TURNED DOWN
	ROUND SUPPLY DUCT TURNED UP
	ROUND SUPPLY DUCT TURNED DOWN
	ROUND RETURN OR EXHAUST DUCT TURNED UP
	ROUND RETURN OR EXHAUST DUCT TURNED DOWN
	OVAL SUPPLY DUCT TURNED UP
	OVAL SUPPLY DUCT TURNED DOWN
	OVAL RETURN OR EXHAUST DUCT TURNED UP
	OVAL RETURN OR EXHAUST DUCT TURNED DOWN
R	CHANGE OF ELEVATION IN DIRECTION INDICATED (D=DROP, R=RISE)
	DIFFUSER W/ AIR PATTERN
	RETURN, EXHAUST OR TRANSFER AIR GRILLE
	SIDEWALL SUPPLY GRILLE OR REGISTER
	SIDEWALL RETURN, EXHAUST OR TRANSFER AIR GRILLE
	LINEAR AIR DEVICE
	MANUAL BALANCING DAMPER
OR	MANUAL BALANCING DAMPER WITH CONCEALED REGULATOR
	MOTORIZED DAMPER
FD	HOUR FIRE DAMPER
FD/SD or FSD	COMBINATION FIRE / SMOKE DAMPER
SD	SMOKE DAMPER
	HORIZONTAL FIRE DAMPER
OR	FLEX DUCT
	FLEX CONNECTION
AD	ACCESS DOOR
	MITERED ELBOW (TURNING VANES UNO)
	RADIUS ELBOW (1.5R RADIUS UNO)
	CONCENTRIC TRANSITION (1 IN 4 MAX SLOPE)
	ECCENTRIC TRANSITION (1 IN 4 MAX SLOPE)

MECHANICAL GENERAL NOTES

A IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR, SUB-CONTRACTORS, MANUFACTURERS AND SUPPLIERS TO ADHERE TO THE REQUIREMENTS OF THE FOLLOWING GENERAL NOTES. IF CONFLICT OCCURS, CONTACT A/E PRIOR TO COMMENCEMENT OF WORK.

B EVERY EFFORT HAS BEEN MADE TO MAKE THESE DOCUMENTS CONCISE AND COORDINATED, TO DEFINE WORK IN THE MOST LOGICAL PLACE AND TO ELIMINATE REDUNDANCY. THE SCOPE OF WORK IS DEFINED THROUGHOUT THE ENTIRE SET OF DRAWINGS & SPECIFICATIONS AND IS NOT LIMITED TO JUST ONE SERIES OF DRAWINGS OR DIVISION OF SPECIFICATIONS. REVIEW THE ENTIRE SET OF CONTRACT DOCUMENTS TO DETERMINE EACH CONTRACTOR'S SCOPE OF WORK. NO ADDITIONAL COST SHALL BE INCURRED BY THE OWNER FOR CONTRACTOR'S FAILURE TO UNDERSTAND THE FULL SCOPE OF WORK. IF CONFLICT OCCURS, CONTACT A/E PRIOR TO COMMENCEMENT OF WORK.

C PROVIDE ALL MATERIALS, LABOR, AND EQUIPMENT AS REQUIRED TO INSTALL COMPLETE AND OPERABLE SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED, AS REQUIRED BY ALL APPLICABLE CODES, AND PER MANUFACTURER'S DIRECTIONS.

D NO CUTTING SHALL BE DONE TO ANY OF THE STRUCTURAL MEMBERS THAT WOULD TEND TO LESSEN THEIR STRENGTH, UNLESS SPECIFIC PERMISSION IS GRANTED BY THE ARCHITECT.

E ALL PIPING AND DUCTWORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AND DUCTWORK AROUND OBSTRUCTIONS AND AS REQUIRED FOR SERVICE SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.

F COORDINATE CONSTRUCTION OF ALL WORK WITH ARCHITECTURAL, CIVIL, STRUCTURAL, PLUMBING, ELECTRICAL WORK, ETC., SHOWN ON ALL OTHER CONTRACT DOCUMENT DRAWINGS.

G VERIFY AND COORDINATE ALL FINAL EQUIPMENT SIZES AND CONNECTING SERVICES WITH ACTUAL EQUIPMENT SUBMITTED AND APPROVED & OWNER PROVIDED EQUIPMENT.

H ALL OPENINGS IN FIRE WALLS FOR DUCTWORK, PIPING, CONDUITS, ETC., SHALL BE FIRE STOPPED WITH A SPECIFIED PRODUCT SIMILAR TO 3M, OR APPROVED EQUAL.

I UNLESS OTHERWISE SHOWN, LOCATE ALL ROOM THERMOSTATS, SENSORS, AND HUMIDISTATS 4'-0" ABOVE FINISHED FLOOR. LOCATIONS ADJACENT TO DOORS SHALL MAINTAIN A MINIMUM OF 24" FROM FRAME.

J ALL DUCTWORK DIMENSIONS AS SHOWN ON THE DRAWINGS, ARE INTERNAL CLEAR DIMENSIONS AND DUCT SIZE SHALL BE INCREASED TO COMPENSATE FOR DUCT LINER THICKNESS, WHERE DUCT LINER IS SPECIFIED.

K COORDINATE MBD, DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING, AND OTHER CEILING ITEMS. MBD's SHALL BE FULLY ACCESSIBLE. MAKE MINOR DUCT MODIFICATIONS AS REQUIRED.

L LOCATE ALL MECHANICAL EQUIPMENT FOR UNOBSTRUCTED ACCESS TO UNIT ACCESS PANELS, CONTROLS, AND VALVING. MAINTAIN THE MINIMUM SERVICE CLEARANCE PER MANUFACTURER.

M ALL ROOF MOUNTED EQUIPMENT REQUIRING SERVICE SHALL BE MOUNTED A MINIMUM OF 10 FEET FROM ROOF EDGE UNLESS THE PARAPET IS 36" HIGH OR UNLESS NOTED OTHERWISE.

N RUNS OF FLEXIBLE DUCT SHALL NOT EXCEED 4 FEET OR BEND GREATER THAN 90°.

O EXHAUST OUTLETS, GAS VENTS AND PLUMBING VENTS SHALL TERMINATE A MINIMUM OF 10 FEET FROM FRESH AIR INTAKES OR 2 FEET ABOVE HIGHEST POINT OF FRESH AIR INTAKE.

P PROVIDE ACCESS DOORS IN DUCTWORK FOR ALL FIRE DAMPERS, SMOKE DAMPERS, HUMIDIFIERS, COILS, AND OTHER ITEMS LOCATED IN DUCTWORK WHICH REQUIRE SERVICE AND/OR INSPECTION.

Q PROVIDE ACCESS PANELS IN WALLS AND CEILINGS TO ALLOW ADEQUATE ACCESS TO EQUIPMENT, VALVES, TRAPS, DAMPERS, CLEANOUTS, CONTROLS, ETC.

R COORDINATE WITH ELECTRICAL AS REQUIRED TO MAINTAIN 36" OF CLEAR SERVICE SPACE FOR 120V, 208V, AND 230V DEVICES AND 42" CLEAR SPACE FOR 480V DEVICES. THIS SHALL INCLUDE SWITCH GEAR, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, ETC. LOCATION OF THE SERVICE SPACE SHALL BE DETERMINED BY THE SPECIFIC ELECTRICAL DEVICE.

S COORDINATE WITH ELECTRICAL AS REQUIRED TO ROUTE NO DUCT OR PIPE DIRECTLY OVER DEVICES SUCH AS PANELBOARDS, MOTOR CONTROL CENTERS AND SWITCHBOARDS UNLESS IT IS A MINIMUM OF 6' 6" ABOVE THE TOP OF THE DEVICE, OR PROTECTION FROM DAMAGE FROM THE PIPE OR DUCT IS PROVIDED. THIS SHALL INCLUDE NOT ONLY PROTECTION FROM LEAKS, BUT FROM BREAKAGE.

T LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UPSTREAM AND DOWNSTREAM AS REQUIRED BY THE MANUFACTURER FOR GOOD ACCURACY.

U INSTALL PIPING SO THAT VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, TEMPERATURE SENSORS, FLOW METERS, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.

COMPUTER ROOM AIR CONDITIONER SCHEDULE

MARK	UNIT AIRFLOW (CFM)	ESP (inH20)	ENT. DB (°F)	ENT. WB (°F)	AIR FACE VELOCITY (FT/MIN)	AMB. DB (°F)	NTCC (kBtu/hr)	NSCC (kBtu/hr)	LVG DB (°F)	LVG WB (°F)	SYSTEM POWER INPUT (KW)	SYSTEM SCOP (W/W)	INTERNAL FILTER CLASS	REFRIG.	COMPRESSOR DATA			EVAPORATOR DATA			HUMIDIFIER DATA	COOLING FAN DATA		EER/IEER	ELECTRICAL DATA			WEIGHT (LBS)	EXAMPLE: LIEBERT
															NO. OF UNITS	TYPE	POWER SUPPLY	NO. OF ROWS	FIN DENSITY (FPI)	FACE AREA (FT²)	TYPE	QTY. OF FANS	TYPE		VOLTS	PH	HZ		DS MODEL
CRAC-1	9,600	0.20	75.0	62.5	382	105	238	191	56.4	53.7	29.0	1.93	MERV 8 (STD)	R407C	2	DIGITAL	208/3/60	3	12	24.65	INFRARED	2	EC PLUG FAN UNDER FLOOR	9.7/11.2	208V	3Ø	60	1,970	DS070AD
CRAC-2	9,600	0.20	75.0	62.5	382	105	238	191	56.4	53.7	29.0	1.93	MERV 8 (STD)	R407C	2	DIGITAL	208/3/60	3	12	24.65	INFRARED	2	EC PLUG FAN UNDER FLOOR	9.7/11.2	208V	3Ø	60	1,970	DS070AD

NOTES:
1. CAPACITIES SHOWN HAVE BEEN REDUCED BY FAN MOTOR(S) HEAT (NET).
2. SYSTEM POWER INPUT INCLUDES COMPRESSOR(S), BLOWER MOTOR(S), CONDENSER(S), AND CONTROL POWER.
3. COIL AIRFLOW IS REDUCED BY A BYPASS OF 2% OF TOTAL UNIT AIRFLOW.
4. CAPACITY TOLERANCE IS 5%.
5. CFM, ALSO KNOWN AS ACFM, IS THE UNIT ACTUAL AIR FLOW RATE WHEN MEASURED AT THE SPECIFIC ENTERING TEMPERATURE AND BAROMETRIC CONDITIONS THAT DEFINE A UNIQUE AIR DENSITY.
6. NTCC, NET TOTAL COOLING CAPACITY.
7. NSCC, NET SENSIBLE COOLING CAPACITY.
8. PROVIDE SYSTEM WITH BACNET CONTROLS CARD FOR COMPLETE INTEGRATION INTO AUTOMATED LOGIC FRONT END.

CONDENSER SCHEDULE

MARK	DESIGN AMBIENT (°F)	THR (kBtu/hr)	ELECTRICAL DATA			EXAMPLE: LIEBERT
			VOLTS	PH	HZ	
CU-1	105	322.9	208V	3Ø	60	MCL110E2
CU-2	105	322.9	208V	3Ø	60	MCL110E2

NOTES:
1. PROVIDE CONDESING UNITS WITH 60" LEGS TO RAISE UNIT INTO CROSS VENTILATED PORTION OF THE SCREENED ENCLOSURE.

FAN SCHEDULE

MARK	CFM	SP	RPM	TYPE	ELECTRICAL	EXAMPLE:
EF-1	500	0.75	1200	CABINET	120V, 1Ø, 60HZ	GREENHECK CSP-A1550

NOTES:
1. INSTALL FAN WITH SPEED CONTROL FOR BALANCING PURPOSES.
2. INSTALL FAN WITH FILTER FRAME UNIT. REFER TO DRAWINGS FOR ADDITIONAL REQUIREMENTS.

UNIT VENTILATOR SCHEDULE

MARK	PROCESS CFM	ESP	REACTIVATION HEATER	REACT. CFM	ELECTRICAL	EXAMPLE:
UV-1	100	0.75"	1.5 KW	55	110V, 1Ø, 60HZ	MUNTERS HC-150-R

NOTES:
1. MAINTAIN UNIT CLEARANCES FOR INSTALLATION.
2. PROCESS AIR SHALL BE OUTSIDE AIR FOR VENTILATION PURPOSES.
3. REACTIVATION AIR SHALL BE OUTSIDE AIR (SUPPLY AND EXHAUST).

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SHEET CONTENTS:
MECHANICAL DETAILS & SCHEDULES

DATE:
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JOB NO.:
18465.01

SHEET:
M0.01

AGNEW ASSOCIATES, INC.
MECHANICAL & ELECTRICAL CONSULTING ENGINEERS
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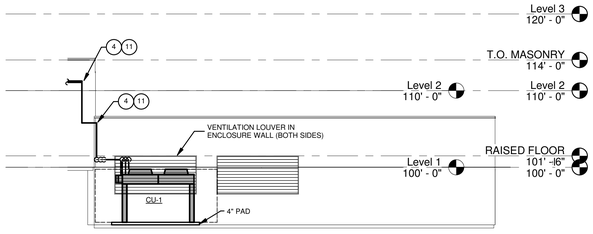
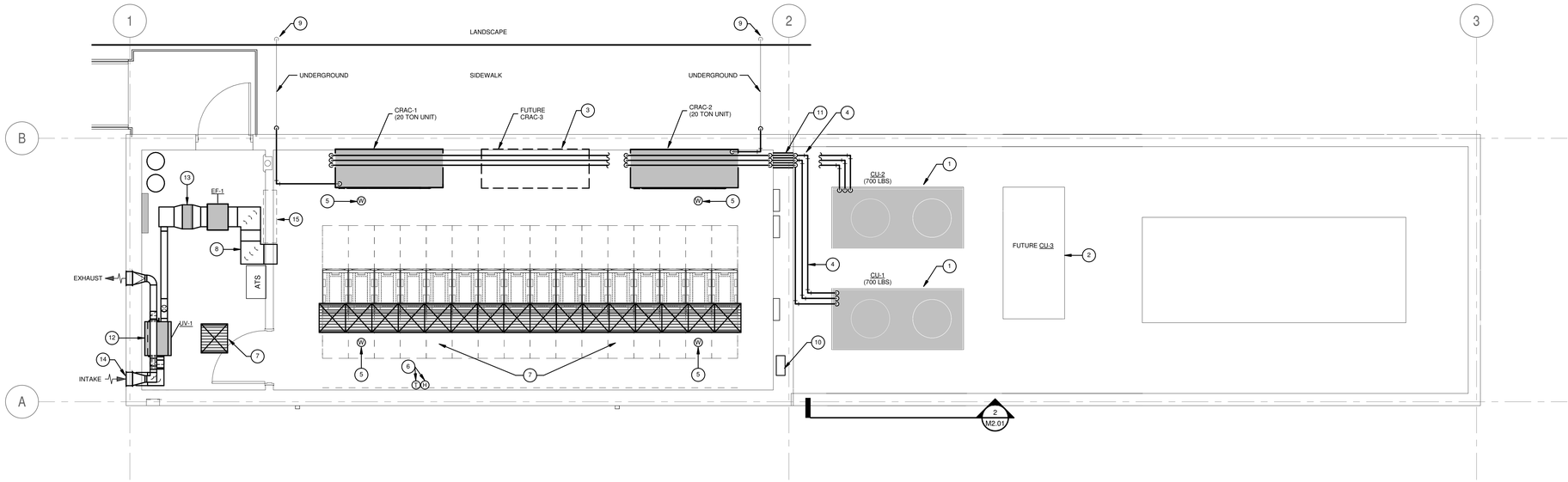


2 M2.1 Section 1

SCALE: 1/8" = 1'-0"

NOTES INDICATED BY "◯ "

1. INSTALL CONDENSING UNIT ON EQUIPMENT PAD. STAINLESS STEEL L-BOLTS SHALL BE INSTALLED DURING PAD POUR TO SECURE EQUIPMENT TO FOUNDATION. COORDINATE SIZE AND LOCATION OF BOLTS WITH MANUFACTURER.
2. INSTALL ADDITIONAL PAD FOR FUTURE CONDENSER INSTALLATION.
3. MAINTAIN CLEAR FLOOR SPACE FOR FUTURE INSTALLATION OF CRAC-3.
4. ROUTE REFRIGERANT LINES UP EXTERIOR WALL TO SEALED SLEEVE WALL PENETRATIONS. SLEEVE PENETRATIONS SHALL BE BELOW THE TOP OF THE EXTERIOR ENCLOSURE AND PROTECTED BY THE GRATING ABOVE. INSTALL WITH MECHANICAL SLEEVE SEALS AND TEST TO ENSURE LEAK PROOF INSTALLATION. ALL EXTERIOR REFRIGERANT LINES SHALL BE JACKETED.
5. INSTALL FLOOD DETECTION SENSORS WITHIN THE RAISED FLOOR. DETECTORS SHALL BE INTEGRATED INTO BAS.
6. INSTALL ADDITIONAL TEMPERATURE AND HUMIDITY SENSOR FOR MONITORING COLD AISLE CONDITIONS. INSTALL SENSORS WITH SEALED AND INSULATED BACKBOXES TO PROVIDE ACCURATE INDOOR MEASUREMENT. SUPPLY AND RETURN TEMPERATURE AND HUMIDITY SHALL BE MONITORED THROUGH THE INTEGRATED BACNET CONTROLS OF THE CRAC UNITS.
7. INSTALL 24"X24" FLOOR MOUNTED SUPPLY DIFFUSER IN RAISED FLOOR OF BUILDING. DIFFUSERS SHALL BE EQUAL TO GLOBAL IFS UFAD PERF1250 AND INCLUDE OBD FOR BALANCING AIRFLOW THROUGH SPACE. DIFFUSERS IN FRONT OF OPERATIONAL SERVERS SHALL BE BALANCED TO PROVIDE 1,100 CFM AT MAX FLOW CONDITIONS. DIFFUSER IN VESTIBULE SHALL BE CAPABLE OF 1,100 CFM, BUT SHALL BE BALANCED INITIALLY TO 500 CFM.
8. RETURN AIR TRANSFER DUCT TO BE INSTALLED ACROSS PARTITION AS INDICATED. DUCT SHALL BE DOUBLE WALL WITH PERFORATED INNER LINER TO REDUCE SOUND TRANSMISSION AND MAINTAIN SEPARATION BETWEEN INTERSTITIAL INSULATION AND AIRSTREAM.
9. ROUTE 1-1/4" CONDENSATE DRAIN LINE THROUGH RAISED FLOOR WITH MECHANICAL SLEEVE SEAL PENETRATION OF EXTERIOR WALL. DISCHARGE TO DRY WELL RECEIVER WITH PERFORATED DRAIN ROUTED THROUGH LANDSCAPE.
10. INSTALL FIRE SUPPRESSION OVER PRESSURE VALVE IN SIDE WALL OF BUILDING APPROXIMATELY 96" AFF.
11. INSTALL THREE SETS OF SEALED SLEEVE FOR REFRIGERANT LINE SETS. CAP THE TOP SET FOR FUTURE.
12. INSTALL UNIT VENTILATOR JUST BELOW CEILING EXPOSED IN VESTIBULE. ROUTE REACTIVATION AIR DUCTS AND PROCESS AIR INTAKE TO LOUVER, SLOPED TO EXTERIOR, AND SEALED FOR WATER TIGHT PENETRATION.
13. INSTALL INLINE FILTER RACK EQUAL TO CAMFIL 4P GLIDEPACK WITH 4" - 24X12 MERV 13 FILTER MEDIA.
14. REACTIVATION AIR INTAKE DUCT ABOVE PROCESS AIR INTAKE DUCT. BOTH SHALL BE SEALED TO LOUVER INTAKE, SLOPED TO EXTERIOR, AND FULLY INSULATED.
15. MAINTAIN 48" OF CLEAR WALL SPACE FOR FUTURE INSTALLATION OF DOOR OR PREPARED OPENING.



FLOOR PLAN - MECHANICAL

SCALE: 1/4" = 1'-0"

NORTH

HVAC INSTRUMENTATION AND CONTROLS - POINTS LIST

POINT DESCRIPTION	POINT TYPE				POINT FUNCTION										POINT APP.			COS ALARM				DDC	
	BINARY	ANALOG	INPUT	OUTPUT	FEEDBACK	STATUS	START / STOP	CO2	TEMPERATURE	HUMIDITY	POSITION	PRESSURE	FLOW	KILOWATTS	DDC	MONITOR	PROGRAM S / S	INTERLOCK	HIGH LIMIT	LOW LIMIT	OFF NORMAL	LOC DISPLAY	LOC ADJUSTMENT
CRAC SYSTEM (SEQUENCE CRAC-1) - TYPICAL OF 2 SYSTEMS																							
BACNET CARD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
UNIT START/STOP	X			X			X								X	X	X						
FAN SPEED		X		X							X				X	X							
SUPPLY FAN STATUS	X		X			X									X	X							
SPACE TEMP		X	X						X						X	X							
WITH TEMP SETPOINT		X	X						X						X	X							X
AND SCHEDULE OVERRIDE	X		X			X									X	X				X			X
SPACE HUMIDITY		X	X							X					X	X			X				
COMPRESSOR 1 (VARIABLE SCROLL)		X		X			X								X	X							
COMPRESSOR STATUS	X		X			X									X	X							
COMPRESSOR 2 (VARIABLE SCROLL)		X		X			X								X	X							
COMPRESSOR STATUS	X		X			X									X	X							
REHEAT START/STOP		X		X			X								X	X							
REHEAT HEAT AMPS		X	X											X	X				X	X			
SUPPLY AIR TEMP		X	X						X						X	X							
RETURN AIR TEMP		X	X						X						X	X							
EMERGENCY SHUTDOWN	X		X	X			X								X	X					X		
MODULATING RETURN AIR DAMPER		X		X							X				X								X
ALARM STATUS	X		X			X									X	X		X					
* NOTE - CRAC BACNET CARD SHALL BE FULLY INTEGRATED INTO BAS SYSTEM. VERIFY EQUIPMENT SEQUENCE & POINT REQUIREMENTS ARE MET.																							
UNIT VENTILATORY (UV-1)																							
UNIT START/STOP	X			X			X								X		X						
FAN STATUS	X		X			X									X	X							
SUPPLY AIR TEMP		X	X						X						X	X							
SUPPLY AIR HUMIDITY		X	X							X					X	X			X				
RETURN AIR HUMIDITY		X	X							X					X	X			X				
OA TEMP		X	X						X						X	X							
OA HUMIDITY		X	X							X					X	X			X				
ALARM STATUS	X		X			X									X	X		X					
FANS (SEQUENCE EF-1)																							
FAN START/STOP	X		X			X									X	X		X					
FAN STATUS	X			X			X								X	X							
WET SENSOR (SEQUENCE MS-1)																							
WET SENSOR STATUS	X			X		X									X	X					X		

BUILDING CONTROL SYSTEM:

A. REFER TO SPECIFICATION SECTION 230900 FOR ADDITIONAL BAS REQUIREMENTS.

B. THE FMS FOR THIS FACILITY WILL BE REQUIRED TO COMMUNICATE WITH AND SEAMLESSLY INTEGRATE WITH THE EXISTING AUTOMATED LOGIC HOST END SYSTEM (LOCATED IN THE WILLIAMSON COUNTY BUILDING). NO ADDITIONAL PERSONAL COMPUTERS, OPERATOR WORKSTATIONS, OR OPERATOR INTERFACE WILL BE REQUIRED BEYOND THAT WHICH IS EXISTING AT THE CENTRAL OFFICE. THE SITE TO SITE COMMUNICATIONS WILL BE ETHERNET. FMS INTERFACE IS TO BE COMPATIBLE WITH THE COUNTY'S EXISTING CONTROLS GRAPHICAL AND LOGIC SOFTWARE BY EITHER DIRECT OR VIA NATIVE BACNET PROTOCOL. ALL FIELD LOGIC CONTROLLERS MUST BE PROGRAMMED TO RUN THE SEQUENCE LOGIC IN AN OCCUPIED MODE IN CASE OF LOSS IN COMMUNICATIONS BETWEEN THE CONTROLLERS AND THE HOST.

C. THE BAS SYSTEM SHALL PROVIDE THE FOLLOWING POINTS AT A MINIMUM FOR THE CONTROL OF THE NEW HVAC SYSTEMS. COORDINATE WITH THE UNIT MANUFACTURER WHERE INTEGRATION OF A BACNET CARD IS REQUIRED TO PROVIDE GUI POINTS FOR ALL REASONABLE EQUIPMENT OPERATION CONTROLS.

D. CRAC-1 AND CRAC-2 SHALL STAGE AND OPERATE TO MAINTAIN TEMPERATURE AND HUMIDITY CONDITIONS IN THE COLD AISLE OF THE IT BUILDING. PRELIMINARY SETPOINTS SHALL BE 68°F AND 50% RH.

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STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER
5/23/2019

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
FLOOR PLAN - MECHANICAL - AREA A

DATE:
05/23/2019

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18465.01

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M2.01

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NOTES INDICATED BY "◯"

1. INSTALL NEW CLEAN-AGENT FIRE EXTINGUISHING SYSTEM EQUAL TO NOVEC-1230 WITH TWO CYLINDERS AND MASTER CONTROL PANEL INSTALLED AS INDICATED. INSTALL NOZZLES FOR COMPLETE COVERAGE OF DATA ROOM AND RAISED FLOOR VOLUMES. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. LOCATION FOR FIRE SUPPRESSION SYSTEM OVER PRESSURE VALVE INSTALLATION.
3. A FIRE DETECTION AND ALARM SYSTEM SHALL BE INSTALLED PER SPECIFICATION 212200. SYSTEM SHALL EMPLOY A CROSS-ZONED AIR-SAMPLING AND PHOTOELECTRIC DETECTORS REPORTING TO A CONTROL PANEL. A VERIFIED DETECTION SYSTEM SHALL INDICATE ALARM UPON ACTIVATION OF A SINGLE-DETECTION DEVICE AND RELEASE EXTINGUISHING AGENT ON ACTUATION OF A SECOND DETECTION DEVICE. ALARMS AND FAN SHUT-DOWNS SHALL BE PROVIDED AS SPECIFIED.
4. MECHANICAL SYSTEM SHALL AUTOMATICALLY SHUTDOWN UPON FIRE DETECTION SYSTEM ALARM.

FIRE PROTECTION SYSTEM GENERAL NOTES

A IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR, SUB-CONTRACTORS, MANUFACTURERS AND SUPPLIERS TO ADHERE TO THE REQUIREMENTS OF THE FOLLOWING GENERAL NOTES. IF CONFLICT OCCURS, CONTACT ARCHITECT/ENGINEER PRIOR TO COMMENCEMENT OF WORK.

B EVERY EFFORT HAS BEEN MADE TO MAKE THESE DOCUMENTS CONCISE AND COORDINATED, TO DEFINE WORK IN THE MOST LOGICAL PLACE AND TO ELIMINATE REDUNDANCY. THE SCOPE OF WORK IS DEFINED THROUGHOUT THE ENTIRE SET OF DRAWINGS & SPECIFICATIONS AND IS NOT LIMITED TO JUST ONE SERIES OF DRAWINGS OR DIVISION OF SPECIFICATIONS. EVERY EFFORT HAS BEEN MADE TO MAKE THESE DOCUMENTS CONCISE AND COORDINATED, TO DEFINE WORK IN THE MOST LOGICAL PLACE AND TO ELIMINATE REDUNDANCY. THE SCOPE OF WORK IS DEFINED THROUGHOUT THE ENTIRE SET OF DRAWINGS & SPECIFICATIONS AND IS NOT LIMITED TO JUST ONE SERIES OF DRAWINGS OR DIVISION OF SPECIFICATIONS.

C REVIEW THE ENTIRE SET OF CONTRACT DOCUMENTS TO DETERMINE EACH CONTRACTOR'S SCOPE OF WORK. NO ADDITIONAL COST SHALL BE INCURRED BY THE OWNER FOR CONTRACTOR'S FAILURE TO UNDERSTAND THE FULL SCOPE OF WORK. IF CONFLICT OCCURS, CONTACT ARCHITECT/ENGINEER PRIOR TO COMMENCEMENT OF WORK.

D COORDINATE CONSTRUCTION OF ALL WORK WITH ARCHITECTURAL, CIVIL, STRUCTURAL, MECHANICAL, PLUMBING, ELECTRICAL WORK, ETC., SHOWN ON ALL OTHER CONTRACT DOCUMENT DRAWINGS.

E THE ENTIRE FIRE PROTECTION SYSTEM SHALL BE DESIGNED, HYDRAULICALLY CALCULATED AND INSTALLED PER THE CURRENT VERSION OF NFPA 13, ALL FEDERAL, STATE & LOCAL CODES AND ORDINANCES. THE SYSTEM SHALL BE APPROVED BY THE LOCAL AUTHORITY HAVING JURISDICTION.

F APPROVED SHOP DRAWINGS SHALL BE AVAILABLE ON THE PROJECT SITE DURING THE INSTALLATION AND INSPECTION OF WORK.

G ALL MATERIALS SHALL BE UL LISTED AND/OR FM APPROVED FOR FIRE PROTECTION USE.

H SIZING OF ALL PIPE, SPRINKLER HEADS, AND ACCESSORIES (UNLESS NOTED OTHERWISE), SHALL BE THE RESPONSIBILITY OF THE SPRINKLER CONTRACTOR.

I SYSTEM SHALL BE TESTED AT 200 PSI FOR MINIMUM 2 HOURS.

J ACCEPTANCE TEST SHALL BE PERFORMED BY THE CONTRACTOR, WITNESSED AND APPROVED BY THE AUTHORITY HAVING JURISDICTION PRIOR TO ISSUANCE AND OCCUPANCY. FINAL APPROVAL SHALL BE BY ARCHITECT/ENGINEER.

K GENERAL ROUTING OF FIRE MAINS SHALL BE INSTALLED IN JOIST SPACE OR AS HIGH AS POSSIBLE.

L ALL PIPING SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AROUND OBSTRUCTIONS AND AS REQUIRED FOR SERVICE SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.

M CONTRACTOR SHALL ENSURE THAT ALL PIPING IS CONCEALED EXCEPT WHERE PROTECTION OF EXPOSED STRUCTURE IS REQUIRED. IN AREAS OPEN TO STRUCTURE, RUN ALL PIPING PARALLEL OR PERPENDICULAR TO STRUCTURE.

N COORDINATE ALL ROUTING OF PIPING WITH ARCHITECTURAL REFLECTED CEILING PLAN AND ROUTE ALL PIPING AROUND CLEAR STORY AREAS. PROVIDE PROPOSED ROUTING FOR APPROVAL BY ARCHITECT AND/OR ENGINEER PRIOR TO INSTALLATION.

O CONTRACTOR SHALL USE UL LISTED FIRE ASSEMBLY SYSTEM TO ROUTE ALL FIRE SPRINKLER PIPING THROUGH ALL FIRE RATED WALLS, VERIFY EXACT FIRE WALL LOCATIONS WITH ARCHITECTURAL PLANS.

P PIPE HANGERS SHALL BE SELECTED AND SPACED PER NFPA REQUIREMENTS. SPECIAL HANGERS SHALL BE INSTALLED IN ACCORDANCE WITH THEIR MANUFACTURER LISTINGS/GUIDELINES. NO OTHER DUCTWORK, PIPING OR DEVICES SHALL BE ATTACHED TO THE SPRINKLER PIPING OR ITS' HANGERS.

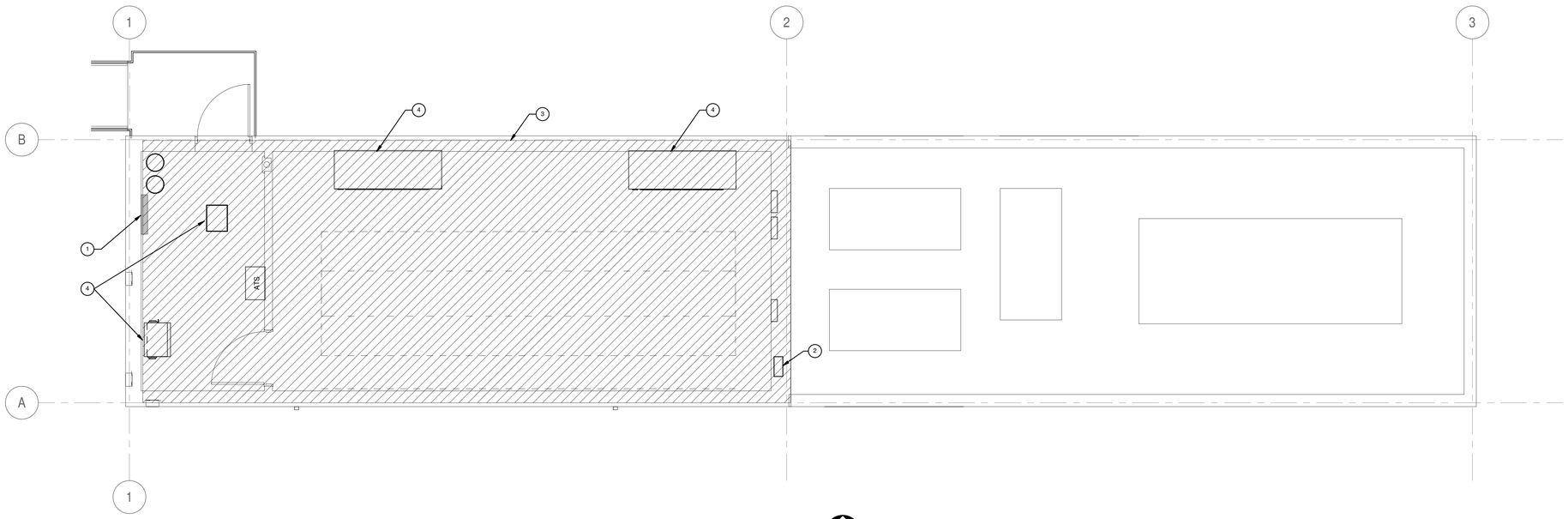
Q PROVIDE SIGNAGE PER NFPA STANDARDS UPON INSPECTION BY AUTHORITY HAVING JURISDICTION.

R PROVIDE RECESSED SPRINKLER HEADS IN ALL CEILING AREAS. ALL SPRINKLER HEADS IN LAY-IN CEILINGS SHALL BE CENTERED IN BOTH DIRECTIONS. COORDINATE SPRINKLER LOCATIONS WITH DIFFUSERS, REGISTERS, GRILLES, LIGHTING, ARCHITECTURAL REFLECTED CEILING PLANS, AND OTHER CEILING ITEMS.

S ENSURE SPRINKLER HEADS AND PIPING IN I.T. OR ELECTRICAL ROOMS ARE NOT LOCATED DIRECTLY OVER ANY EQUIPMENT.

T PROVIDE STOCK OF SPARE SPRINKLERS IN ACCORDANCE WITH NFPA 13.

U REFER TO THE FIRE PROTECTION SPECIFICATIONS FOR ADDITIONAL INFORMATION REGARDING THE FIRE PROTECTION SYSTEM.



FLOOR PLAN - FIRE PROTECTION

SCALE: 1/4" = 1'-0"

NORTH

STATE OF TEXAS
DONALD SMITH
94788
LICENSED PROFESSIONAL ENGINEER
5/23/2019

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
FIRE PROTECTION GENERAL NOTES & DETAILS

DATE:
05/23/2019

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FP0.01

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Bluebeam 2018

GENERAL NOTES

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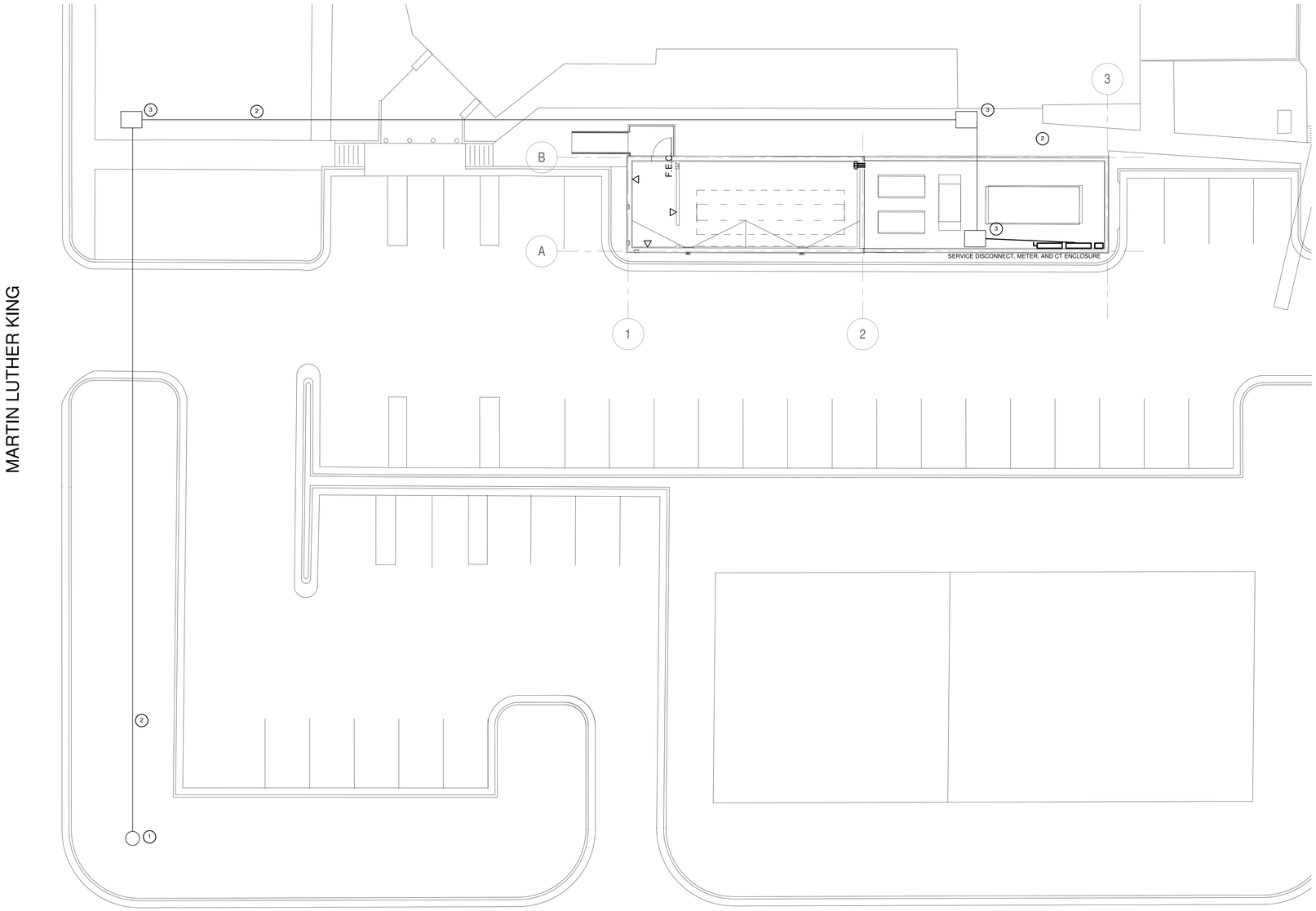
C VERIFY THE EXACT LOCATION OF ALL EXISTING AND NEW UTILITIES AT THE SITE WITH THE UTILITY COMPANIES.

NOTES INDICATED BY "◯"

1 NEW RISER POLE AND POLE MOUNT TRANSFORMERS TO BE TIED INTO EXISTING THREE PHASE POWER ACROSS MLK. COORDINATE WORK WITH ELECTRIC PROVIDER.

2 UNDERGROUND SECONDARY CONDUIT AND CONDUCTORS. SEE RISER DIAGRAM

3 PULL BOX



ELECTRICAL SITE PLAN

SCALE: 3/32" = 1'-0"

NORTH

STATE OF TEXAS
JAMES HOLLOWAY
114321
LICENSED PROFESSIONAL ENGINEER
05/23/19

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ELECTRICAL SITE PLAN

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Bluebeam 2018

ELECTRICAL LEGEND

LIGHTING

SYMBOL	DESCRIPTION
A LPA-1	LIGHTING FIXTURE - TYPE & CIRCUIT NOTED
A1 LPA-1	LIGHTING FIXTURE WITH BATTERY BACK-UP - TYPE & CIRCUIT NOTED
A LPA-1	LIGHTING FIXTURE - TYPE & CIRCUIT NOTED
A LPA-1	LIGHTING FIXTURE WITH BATTERY BACKUP - TYPE & CIRCUIT NOTED
A LPA-1	WALL WASHER - TYPE & CIRCUIT NOTED
A LPA-1	WALL MOUNTED LIGHTING FIXTURE - TYPE & CIRCUIT NOTED
X	CEILING MOUNTED EXIT SIGN - TYPE NOTED - DIRECTIONAL ARROWS INDICATED
X	WALL MOUNTED EXIT SIGN - TYPE NOTED - DIRECTIONAL ARROWS INDICATED
A LPA-1	EMERGENCY LIGHTING FIXTURE - TYPE & CIRCUIT NOTED
A LPA-1	FLOOD LIGHT - TYPE & CIRCUIT NOTED
A LPA-1	POLE MOUNTED LIGHTING FIXTURE - TYPE & CIRCUIT NOTED
A LPA-1	GROUND MOUNTED BOLLARD LIGHT - TYPE & CIRCUIT NOTED
E	EXISTING LIGHT FIXTURE TO REMAIN
E	EXISTING LIGHT FIXTURE TO BE REMOVED
E	EXISTING LIGHT FIXTURE TO REMAIN
	EXISTING LIGHT FIXTURE TO BE REMOVED
E	EXISTING EXIT LIGHT FIXTURE TO REMAIN
	EXISTING EXIT LIGHT FIXTURE TO BE REMOVED

POWER

SYMBOL	DESCRIPTION
J	JUNCTION BOX
J	FLOOR MOUNTED JUNCTION BOX
P	PULLBOX
	MOTOR LOCATION
	LIGHTING CONTACTOR
LPA-1	DISCONNECT SWITCH - CIRCUIT NOTED
LPA-1	COMBINATION MOTOR STARTER/DISCONNECT SWITCH - CIRCUIT NOTED
T	TIMECLOCK
T	THERMOSTAT LOCATION
	PUSHBUTTON
SS	START/STOP PUSHBUTTON
	SURFACE MOUNTED LIGHTING AND APPLIANCE PANELBOARD
	FLUSH MOUNTED LIGHTING AND APPLIANCE PANELBOARD
E	EXISTING JUNCTION BOX TO REMAIN
	EXISTING JUNCTION BOX TO BE REMOVED

WIRING DEVICES

SYMBOL	DESCRIPTION
$	SPST WALL SWITCH
$3	3-WAY WALL SWITCH
$4	4-WAY WALL SWITCH
$P	SPST WALL SWITCH WITH PILOT LIGHT
$K	KEY OPERATED SPST WALL SWITCH
$D	WALL MOUNTED DIMMER SWITCH
$M	WALL MOUNTED OCCUPANCY SENSOR - OPTIONS (M2) TWO POLE
$MD	WALL MOUNTED COMBINATION OCCUPANCY SENSOR/DIMMER
$V	WALL MOUNTED VOLUME CONTROL SWITCH
$L2	WALL MOUNTED LOW VOLTAGE SWITCH - NO. OF BUTTONS / ZONES NOTED
H	CEILING MOUNTED OCCUPANCY SENSOR - OPTIONS (H) HIGH BAY, (S) SYSTEM
S	CEILING MOUNTED DAY LIGHTING SENSOR - OPTIONS (S) SYSTEM
PPDE	OCCUPANCY SENSOR POWER PACK - OPTIONS (D) DIMMING, (E) UL 924 EMERGENCY
LPA-1	DUPLEX RECEPTACLE - 20A, 125V, 2P, 3W, GROUNDING - CIRCUIT NOTED
30A LPA-1	SIMPLEX RECEPTACLE - 125V, 2P, 3W, GROUNDING - AMP RATING AND CIRCUIT NOTED
LPA-1	DUPLEX RECEPTACLE ON EMERGENCY POWER
LPA-1,3 30A	RECEPTACLE - 125/250V, 3P, 3W - AMP RATING AND CIRCUIT NOTED
LPA-1,3,5 60A	RECEPTACLE - 250V, 4P, 4W - AMP RATING AND CIRCUIT NOTED
LPA-1	DOUBLE DUPLEX RECEPTACLE - 20A, 125V, 2P, 3W, GROUNDING - CIRCUIT NOTED
LPA-1 USB	DUPLEX RECEPTACLE WITH TWO USB CHARGING STATIONS - CIRCUIT NOTED
LPA-1 GFI	DUPLEX RECEPTACLE WITH GFI - CIRCUIT NOTED
LPA-1 WP	DUPLEX RECEPTACLE WITH WEATHER-PROOF COVER - CIRCUIT NOTED
LPA-1 EWC	DUPLEX RECEPTACLE WITH GFI SERVING ELECTRIC WATER COOLER - CIRCUIT NOTED
LPA-1	FLOOR MOUNTED DUPLEX RECEPTACLE - CIRCUIT NOTED
LPA-1	FLOOR MOUNTED DOUBLE DUPLEX RECEPTACLE - CIRCUIT NOTED
LPA-1	CEILING MOUNTED DUPLEX RECEPTACLE - CIRCUIT NOTED
2 LPA-1	SURFACE MOUNTED RACEWAY - DEVICES INDICATED
LPA-1	POWER/COMMUNICATIONS POLE - CIRCUIT NOTED
E	EXISTING DUPLEX RECEPTACLE TO REMAIN
E	EXISTING DUPLEX RECEPTACLE TO BE REMOVED
E	EXISTING DOUBLE DUPLEX RECEPTACLE TO REMAIN
E	EXISTING DOUBLE DUPLEX RECEPTACLE TO BE REMOVED
$E	EXISTING SPST WALL SWITCH TO REMAIN
$E	EXISTING SPST WALL SWITCH TO BE REMOVED

COMMUNICATIONS

SYMBOL	DESCRIPTION
2	WALL MOUNTED TELEPHONE DEVICE - NO. OF OUTLETS INDICATED
2	FLOOR MOUNTED TELEPHONE DEVICE - NO. OF OUTLETS INDICATED
2	WALL MOUNTED DATA DEVICE - NO. OF OUTLETS INDICATED
	CEILING MOUNTED DATA DEVICE
2	FLOOR MOUNTED DATA DEVICE - NO. OF OUTLETS INDICATED
	WALL MOUNTED COMMUNICATIONS DEVICE - TWO OUTLETS
	FLOOR MOUNTED COMMUNICATIONS DEVICE - TWO OUTLETS
E	EXISTING COMMUNICATIONS DEVICE TO REMAIN
E	EXISTING COMMUNICATIONS DEVICE TO BE REMOVED
S	CEILING MOUNTED SPEAKER
SC	CEILING MOUNTED COAXIAL SPEAKER
S	WALL MOUNTED SPEAKER
SWP	WALL MOUNTED WEATHER PROOF SPEAKER
M	WALL MOUNTED MICROPHONE OUTLET
M	FLOOR MOUNTED MICROPHONE OUTLET
PCB	PUBLIC ADDRESS CALL-IN BUTTON
V	WALL MOUNTED VIDEO/TV OUTLET LOCATION
VC	CEILING MOUNTED VIDEO/TV OUTLET LOCATION
V	FLOOR MOUNTED VIDEO/TV OUTLET LOCATION
C	CEILING MOUNTED CLOCK
C	WALL MOUNTED CLOCK
CDF	CEILING MOUNTED DUAL FACE CLOCK
CDF	WALL MOUNTED DUAL FACE CLOCK
B	WALL MOUNTED BELL
BWP	WEATHERPROOF WALL MOUNTED BELL

FIRE ALARM

SYMBOL	DESCRIPTION
F	FIRE ALARM PULL STATION
F	FIRE ALARM AUDIBLE ALARM/VISUAL STROBE
FC	CEILING MOUNTED FIRE ALARM AUDIBLE ALARM/VISUAL STROBE
F	FIRE ALARM SPEAKER/VISUAL STROBE
F	FIRE ALARM VISUAL STROBE
FC	CEILING MOUNTED FIRE ALARM VISUAL STROBE
H	FIRE ALARM SMOKE DETECTOR
H	FIRE ALARM HEAT DETECTOR
S	FIRE ALARM DUCT MOUNTED SMOKE DETECTOR IN SUPPLY AIR DUCT
R	FIRE ALARM DUCT MOUNTED SMOKE DETECTOR IN RETURN AIR DUCT
SD	FIRE ALARM SMOKE DAMPER LOCATION
D	FIRE ALARM DOOR HOLD OPEN DEVICE
FS	FIRE ALARM SPRINKLER FLOW SWITCH
TS	FIRE ALARM SPRINKLER TAMPER SWITCH
FE	EXISTING FIRE ALARM PULL STATION
FE	EXISTING FIRE ALARM AUDIBLE ALARM/VISUAL STROBE
FE	EXISTING FIRE ALARM VISUAL STROBE
SE	EXISTING FIRE ALARM SMOKE DETECTOR
	EXISTING FIRE ALARM PULL STATION TO BE REMOVED
	EXISTING FIRE ALARM AUDIBLE ALARM/VISUAL STROBE TO BE REMOVED
	EXISTING FIRE ALARM VISUAL STROBE TO BE REMOVED
	EXISTING FIRE ALARM SMOKE DETECTOR TO BE REMOVED

SECURITY

SYMBOL	DESCRIPTION
R	CARD READER
L	DOOR LOCK
M	MOTION DETECTOR
A	DOOR/WINDOW ALARM MONITOR
G	GLASS BREAK DETECTOR
K	SECURITY KEY PAD
IC	INTERCOM STATION
	SECURITY CAMERA
WP	EXTERIOR SECURITY CAMERA AND ENCLOSURE

NURSE CALL

SYMBOL	DESCRIPTION
N	NURSE CALL PATIENT STATION
E	NURSE CALL EMERGENCY STATION
S	NURSE CALL STAFF STATION
M	NURSE CALL MASTER CONTROL STATION
CB	NURSE CALL CODE BLUE STATION
D	NURSE CALL DOME LIGHT
DZ	NURSE CALL ZONE DOME LIGHT

ELECTRICAL ABBREVIATIONS

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
A	AMPERE(S)	KVAC	KILOVOLT AMPERE CAPACITIVE
ABV	ABOVE	KVAR	KILOVOLT AMPERE REACTIVE
AC	ABOVE COUNTER	KW	KILOWATT
A/C	AIR CONDITIONING	KWH	KILOWATT HOUR
AIC	AMPERE INTERRUPTING CAPACITY	LB	POUND
AFF	ABOVE FINISHED FLOOR	LPS	LOW PRESSURE SODIUM
AFG	ABOVE FINISHED GRADE	M	MANHOLE
AHU	AIR HANDLING UNIT	MAX	MAXIMUM
ATS	AUTOMATIC TRANSFER SWITCH	MCC	MOTOR CONTROL CENTER
BFF	BELOW FINISHED FLOOR	MDP	MAIN DISTRIBUTION PANEL
BFG	BELOW FINISHED GRADE	MECH	MECHANICAL
BLDG	BUILDING	MH	MOUNTING HEIGHT
C	CONDUIT	MIN	MINIMUM
CB	CIRCUIT BREAKER	MLO	MAIN LUGS ONLY
CCTV	CLOSED CIRCUIT TELEVISION	MTG	MOUNTING
CKT	CIRCUIT	MV	MERCURY VAPOR
COND	CONDUCTOR	NA	NON APPLICABLE
CPU	CENTRAL PROCESSING UNIT	NC	NORMALLY CLOSED
DCP	DATA COLLECTION PANEL	NF	NON FUSED
DIA	DIAMETER	NO	NORMALLY OPEN
DIST	DISTRIBUTION	NL	NIGHT LIGHT
DN	DOWN	OC	ON CENTER
DWGS	DRAWINGS	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
EC	EMPTY CONDUIT	OH	OVERHEAD
EDF	ELECTRIC DRINKING FOUNTAIN	P	POLE
EF	EXHAUST FAN	PA	PUBLIC ADDRESS
EQMT	EQUIPMENT	PB	PUSHBUTTON
EWC	ELECTRIC WATER COOLER	PBX	PRIVATE BUILDING EXCHANGE
EXH	EXHAUST	PC	PULL CHAIN
EXP	EXPLOSION PROOF	P/C	PHOTOCELL
EXTG	EXISTING	PDP	POWER DISTRIBUTION PANEL
F/A	FIRE ALARM	PNL	PANELBOARD
FC	FOOTCANDLES	PSI	POUNDS PER SQUARE INCH
FCU	FAN COIL UNIT	PWR	POWER
FLUOR	FLUORESCENT	S	SECURITY
FN	FULL NEUTRAL	SN	SOLID NEUTRAL
FT	FEET, FOOT	SQFT	SQUARE FOOT
GALV	GALVANIZED	SW	SWITCH
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	SWBD	SWITCHBOARD
GFI	GROUND FAULT INTERRUPTER	TC	TIME CLOCK
GND	GROUND	TELE	TELEPHONE
GRD	GALVANIZED RIGID STEEL	TSTAT	THERMOSTAT
HID	HIGH INTENSITY DISCHARGE	TV	TELEVISION
HP	HORSEPOWER	UH	UNIT HEATER
HOA	HAND OFF AUTOMATIC	UON	UNLESS OTHERWISE NOTED
HPS	HIGH PRESSURE SODIUM	UPE	UNDERGROUND PRIMARY ELECTRIC
HVAC	HEATING/VENTILATING/AIR CONDITIONING	V	VOLT(S)
HZ	HERTZ	VP	VAPOR PROOF
IC	INTERCOM	W	WIRE
ID	INSIDE DIAMETER	WAP	WIRELESS ACCESS POINT
IMC	INTERMEDIATE STEEL CONDUIT	WP	WEATHERPROOF
IN	INCHES	XFMR	TRANSFORMER
INC	INCANDESCENT	XPD	TRANSPONDER
IG	ISOLATED GROUND	Z	IMPEDANCE
JB	JUNCTION BOX	1P	ONE POLE
KV	KILOVOLT	2P	TWO POLE
KVA	KILOVOLT AMPERE	3P	THREE POLE
		Ø	PHASE

ELECTRICAL GENERAL NOTES

A IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR, SUB-CONTRACTORS, MANUFACTURERS AND SUPPLIERS TO ADHERE TO THE REQUIREMENTS OF THE FOLLOWING GENERAL NOTES. IF CONFLICT OCCURS, CONTACT A/E PRIOR TO COMMENCEMENT OF WORK.

B EVERY EFFORT HAS BEEN MADE TO MAKE THESE DOCUMENTS CONCISE AND COORDINATED, TO DEFINE WORK IN THE MOST LOGICAL PLACE AND TO ELIMINATE REDUNDANCY. THE SCOPE OF WORK IS DEFINED THROUGHOUT THE ENTIRE SET OF DRAWINGS & SPECIFICATIONS AND IS NOT LIMITED TO JUST ONE SERIES OF DRAWINGS OR DIVISION OF SPECIFICATIONS. REVIEW THE ENTIRE SET OF CONTRACT DOCUMENTS TO DETERMINE EACH CONTRACTOR'S SCOPE OF WORK. NO ADDITIONAL COST SHALL BE INCURRED BY THE OWNER FOR CONTRACTOR'S FAILURE TO UNDERSTAND THE FULL SCOPE OF WORK. IF CONFLICT OCCURS, CONTACT A/E PRIOR TO COMMENCEMENT OF WORK.

C PROVIDE ALL MATERIALS, LABOR, AND EQUIPMENT AS REQUIRED TO INSTALL COMPLETE AND OPERABLE SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED, AS REQUIRED BY ALL APPLICABLE CODES, AND PER MANUFACTURER'S DIRECTIONS.

D SIZE AND LOCATION OF EXISTING EQUIPMENT, CONDUIT, WIRING, ETC. SHOWN FOR REFERENCE ONLY. FIELD VERIFY EXACT CONDITIONS PRIOR TO BID.

E NO CUTTING SHALL BE DONE TO ANY OF THE STRUCTURAL MEMBERS THAT WOULD TEND TO LESSEN THEIR STRENGTH, UNLESS SPECIFIC PERMISSION IS GRANTED BY THE ARCHITECT.

F REMOVE SLEEVES AND PATCH ALL WALLS, FLOORS, AND CEILINGS TO REMAIN WHERE CONDUIT AND/OR ELECTRICAL EQUIPMENT HAS BEEN REMOVED. PATCHES IN RATED CONSTRUCTION SHALL MATCH EXISTING MATERIAL TO ENSURE RATING INTEGRITY.

G COORDINATE DEMOLITION WITH GENERAL CONTRACTOR. OWNER SHALL HAVE FIRST RIGHTS TO ALL REMOVED COMPONENTS. THE REMAINING ITEMS SHALL BE COMPLETELY REMOVED BACK TO ACTIVE SERVICE LOCATION. REMOVE ALL ASSOCIATED HANGERS, SUPPORTS, POWER, CONTROLS, ETC.

H PROVIDE SMOOTH CONCRETE FILL AND PATCH FOR ALL FLOOR MOUNTED OUTLETS BOXES AND FLOOR CHASES NOT BEING REUSED FOR NEW CONSTRUCTION IS COMPLETE.

I COORDINATE CONSTRUCTION OF ALL WORK WITH ARCHITECTURAL, CIVIL, STRUCTURAL, PLUMBING, ELECTRICAL WORK, ETC., SHOWN ON ALL OTHER CONTRACT DOCUMENT DRAWINGS.

J ALL OPENINGS IN FIRE WALLS FOR BOXES, CONDUITS, ETC., SHALL BE FIRE STOPPED WITH A SPECIFIED PRODUCT SIMILAR TO 3M, OR APPROVED EQUAL.

K PROVIDE UPDATED CIRCUIT DIRECTORIES FOR ALL EXISTING PANELBOARDS WHERE NEW CIRCUITS ARE ADDED OR EXISTING CIRCUITS ARE DEMOLISHED.

L ALL CONDUCTORS SHALL BE INSTALLED IN RIGID METAL RACEWAY AS DESCRIBED IN THE SPECIFICATIONS. METAL CLAD, TYPE MC CABLE IS NOT AN ACCEPTABLE WIRING METHOD.

M PROVIDE DEDICATED NEUTRAL CONDUCTORS FOR ALL CIRCUITS REQUIRING A NEUTRAL CONNECTION. SHARING NEUTRAL CONDUCTORS BETWEEN PHASES IS PROHIBITED.

N ALL OUTLET, DEVICE AND JUNCTION BOXES AND ASSOCIATED CONDUIT INDICATED IN NEW BLOCK WALLS SHALL BE CONCEALED IN THE BLOCK WALL. SURFACE MOUNTED BOXES AND CONDUIT ARE NOT ACCEPTABLE AND WILL BE NOTED FOR CORRECTION ON SITE INSPECTION PUNCH LISTS.

O FASTEN JUNCTION AND PULL BOXES TO OR SUPPORT FROM BUILDING STRUCTURE. DO NOT SUPPORT BOXES BY CONDUITS.

BRANCH CIRCUIT AND SERVICE CONDUCTOR SIZING SCHEDULE

BRANCH CIRCUIT/FEEDER IDENTIFICATION	OVERCURRENT DEVICE	PHASE AND NEUTRAL CONDUCTORS (AWG/kcmil)	EQUIPMENT GROUNDING CONDUCTOR(S) (AWG/kcmil)	GROUNDING ELECTRODE CONDUCTOR (AWG/kcmil)	CONDUIT
F20	20	12	12	---	1/2"
F25	25	10	10	---	1/2"
F30	30	10	10	---	1/2"
F35	35	8	10	---	1"
F40	40	8	10	---	1"
F45	45	8	10	---	1"
F50	50	8	10	8	1"
F60	60	6	10	8	1"
F70	70	4	8	8	1-1/4"
F80	80	4	8	8	1-1/4"
F90	90	2	8	8	1-1/4"
F100	100	2	8	8	1-1/4"
F125	125	1/0	6	6	2"
F150	150	1/0	6	6	2"
F175	175	2/0	6	4	2"
F200	200	3/0	6	4	2"
F225	225	4/0	4	2	2-1/2"
F250	250	250 kcmil	4	2	2-1/2"
F300	300	350 kcmil	4	2	3"
F350	350	500 kcmil	2	1/0	4"
F400	400	(2) 3/0	(2) 2	1/0	(2) 2-1/2"
F450	450	(2) 4/0	(2) 2	1/0	(2) 2-1/2"
F500	500	(2) 250 kcmil	(2) 2	1/0	(2) 2-1/2"
F600	600	(2) 350 kcmil	(2) 1/0	2/0	(2) 3"
F700	700	(2) 500 kcmil	(2) 1/0	2/0	(2) 4"
F800	800	(3) 300 kcmil	(3) 1/0	2/0	(3) 3"
F1000	1000	(3) 400 kcmil	(3) 2/0	3/0	(3) 3"
F1200	1200	(4) 350 kcmil	(4) 3/0	3/0	(4) 3"
F1600	1600	(5) 400 kcmil	(5) 4/0	3/0	(5) 3"
F2000	2000	(6) 400 kcmil	(6) 250 kcmil	3/0	(6) 3"
F2500	2500	(7) 500 kcmil	(7) 350 kcmil	3/0	(7) 4"
F3000	3000	(8) 500 kcmil	(8) 400 kcmil	3/0	(8) 4"
F4000	4000	(11) 500 kcmil	(11) 500 kcmil	3/0	(11) 4"

NOTES:

1. WHERE BRANCH CIRCUIT OR FEEDER IS NOT DESIGNATED ON THE DRAWINGS, BRANCH CIRCUIT OR FEEDER SHALL BE SIZED TO MATCH THE OVERCURRENT DEVICE LISTED ABOVE.
2. GROUNDING ELECTRODE CONDUCTORS FOR SEPARATELY DERIVED SYSTEMS SHALL BE SELECTED BASED ON THE SECONDARY FEEDER OVERCURRENT DEVICE RATING.

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JAMES HOLLOWAY
114321
REGISTERED PROFESSIONAL ENGINEER
06/23/19

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WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
ELECTRICAL LEGEND & SCHEDULES

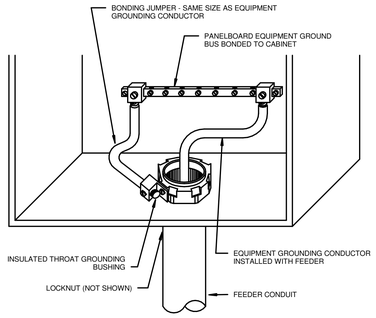
DATE:
05/23/2019

JOB NO.
18465.01

SHEET:
E0.01

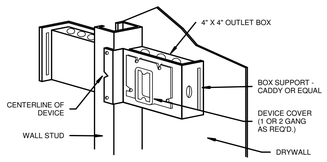
Light Fixture Schedule

TYPE	VOLTAGE	MOUNTING	MANUFACTURER	MODEL NO.	LAMPS	NOTES
A	120	RECESSDED	LITHONIA	2VTL 48L ADP EZ1 LP835	LED	
A1	120	RECESSDED	LITHONIA	2VTL 48L ADP EZ1 LP835 EL14L	LED	
B1	120	SURFACE	KENALL	MR13EL PP XX 20L40K 120V LEL-SA	LED	
X	120	SURFACE	LITHONIA	LQM S W 3 G 120/277 EL N	LED	



PANELBOARD BONDING DETAIL

NO SCALE

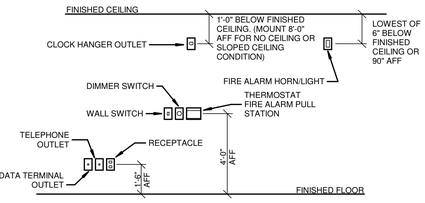


1 OR 2 GANG "BACK TO BACK" BOX DETAIL

NO SCALE

NOTES:

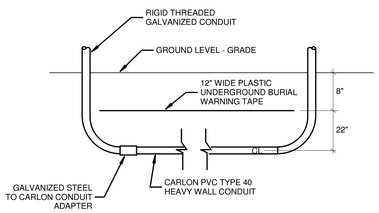
1. TYPICAL FOR OUTLET BOXES IN NON-RATED CONSTRUCTION ONLY.
2. IN FIRE RATED CONSTRUCTION, BOXES MUST BE SEPARATED BY A MINIMUM OF 24" OR BOXES SHALL BE PROTECTED WITH WALL OPENING PROTECTIVE MATERIAL COMPLYING WITH ANSI/UL 263 (QCSN).
3. BOXES LARGER THAN 2 GANG SHALL NOT BE USED IN RATED CONSTRUCTION.



NOTE: VERIFY ALL HEIGHTS WITH ARCHITECT

WIRING DEVICE MOUNTING HEIGHTS - TYPICAL

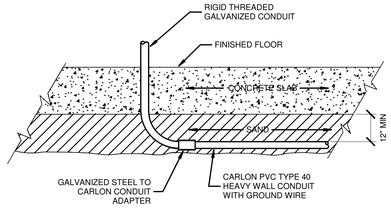
NO SCALE



DIRECT BURIED CONDUIT DETAIL

NO SCALE

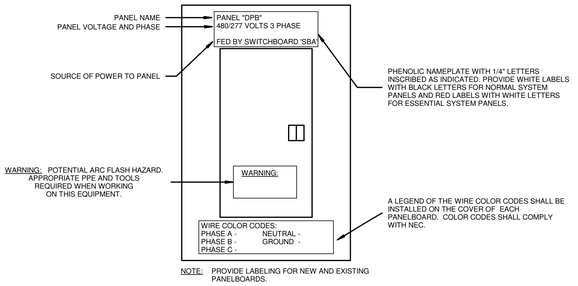
NOTE: THE ABOVE DETAIL SHALL APPLY WHEREVER PVC CONDUIT IS USED UNDERGROUND OR BELOW FLOOR IN LIEU OF RIGID THREADED GALVANIZED CONDUIT. THE ELBOW SHALL BE RIGID GALVANIZED CONDUIT.



BELOW SLAB CONDUIT DETAIL

NO SCALE

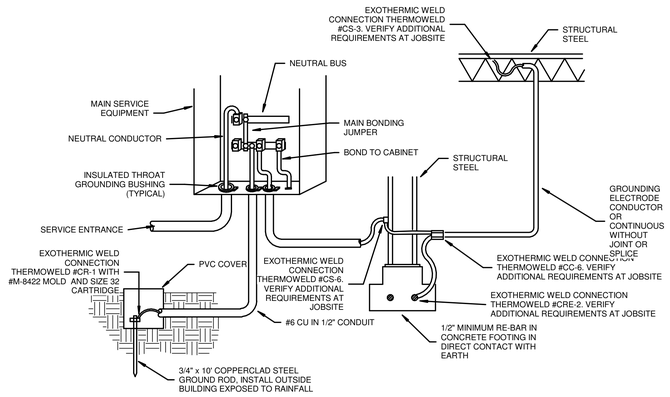
NOTE: THE ABOVE DETAIL SHALL APPLY WHEREVER PVC CONDUIT IS USED UNDERGROUND OR BELOW FLOOR IN LIEU OF RIGID THREADED GALVANIZED CONDUIT. THE ELBOW SHALL BE RIGID GALVANIZED CONDUIT.



NOTE: PROVIDE LABELING FOR NEW AND EXISTING PANELBOARDS.

PANELBOARD IDENTIFICATION DETAIL

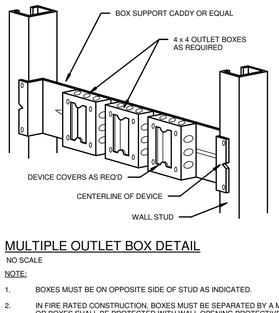
NO SCALE



SERVICE GROUNDING DETAIL

NO SCALE

NOTE: INSTALL GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH THE NEC ARTICLE 250. BONDING JUMPERS SHALL BE THE SAME SIZE AS THE GROUNDING CONDUCTORS.

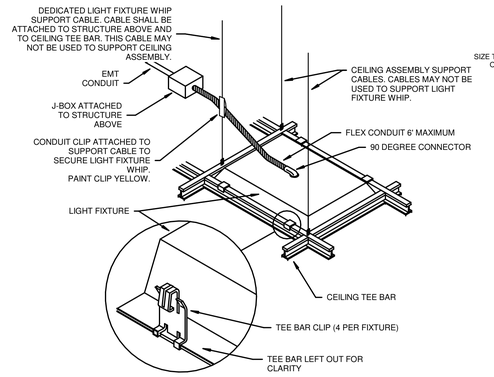


MULTIPLE OUTLET BOX DETAIL

NO SCALE

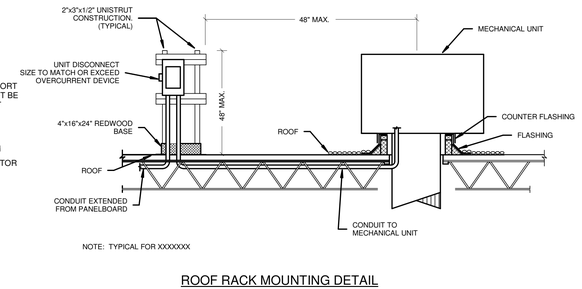
NOTE:

1. BOXES MUST BE ON OPPOSITE SIDE OF STUD AS INDICATED.
2. IN FIRE RATED CONSTRUCTION, BOXES MUST BE SEPARATED BY A MINIMUM OF 24" OR BOXES SHALL BE PROTECTED WITH WALL OPENING PROTECTIVE MATERIAL COMPLYING WITH ANSI/UL 263 (QCSN).
3. BOXES LARGER THAN 2 GANG SHALL NOT BE USED IN RATED CONSTRUCTION.



LAY-IN LIGHT FIXTURE DETAIL

NO SCALE



NOTE: TYPICAL FOR XXXXXXX

ROOF RACK MOUNTING DETAIL

NO SCALE

POWER PACK LEGEND

SYMBOL	MANUFACTURER	MODEL NUMBER	DESCRIPTION
PP	ACUITY	nPP16	LOW VOLTAGE SWITCHING POWER PACK
PP D	ACUITY	nPP16-D	LOW VOLTAGE DIMMING POWER PACK

SENSOR LEGEND

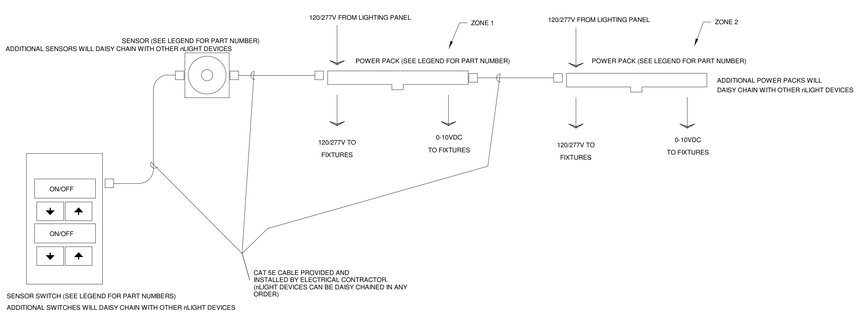
SYMBOL	MANUFACTURER	MODEL NUMBER	DESCRIPTION
C	ACUITY	nCM-PDT-9	CEILING MOUNTED DUAL TECH SENSOR
CX	ACUITY	nCM-PDT-10	CEILING MOUNTED DUAL TECH EXTENDED RANGE SENSOR
CD	ACUITY	nCM-PDT-9-ADCX	CEILING MOUNTED DUAL TECH SENSOR WITH INTEGRAL DAYLIGHT SENSOR
WV	ACUITY	nWV-PDT-16	WALL MOUNTED DUAL TECH WIDE VIEW SENSOR SENSOR
CDS	ACUITY	nCM ADCX	CEILING MOUNTED DAYLIGHT SENSOR
$_M	ACUITY	WSX-PDT-SA-WH	WALL MOUNTED SENSOR
$_M2	ACUITY	WSX-PDT-2P-2SA-WH	WALL MOUNTED TWO POLE SENSOR
$_MD	ACUITY	WSX-PDT-D-SA-WH	WALL MOUNTED DIMMING SENSOR

SWITCH LEGEND

SYMBOL	MANUFACTURER	MODEL NUMBER	DESCRIPTION
$	SEE SPECIFICATIONS	SEE SPECIFICATIONS	SPST WALL SWITCH
$_3	SEE SPECIFICATIONS	SEE SPECIFICATIONS	3-WAY WALL SWITCH
$_4	SEE SPECIFICATIONS	SEE SPECIFICATIONS	4-WAY WALL SWITCH
$_P	SEE SPECIFICATIONS	SEE SPECIFICATIONS	SPST WALL SWITCH WITH PILOT LIGHT
$_K	SEE SPECIFICATIONS	SEE SPECIFICATIONS	KEY OPERATED SPST WALL SWITCH
$_L1	ACUITY	nPODM-WH	WALL MOUNTED SINGLE ZONE LOW VOLTAGE SWITCH
$_L2	ACUITY	nPODM-2P-WH	WALL MOUNTED TWO ZONE LOW VOLTAGE SWITCH
$_L4	ACUITY	nPODM-4P-WH	WALL MOUNTED FOUR ZONE LOW VOLTAGE SWITCH
$_D1	ACUITY	nPODM-DX-WH	WALL MOUNTED SINGLE ZONE LOW VOLTAGE DIMMING SWITCH
$_D2	ACUITY	nPODM-2P-DX-WH	WALL MOUNTED TWO ZONE LOW VOLTAGE DIMMING SWITCH
$_D4	ACUITY	nPODM-4P-DX-WH	WALL MOUNTED FOUR ZONE LOW VOLTAGE DIMMING SWITCH
$_TS	ACUITY	FCS7TSN-BX	FRESCO TOUCHSCREEN

SWITCH WIRE LEGEND

LINE TYPE	DESCRIPTION
----------	CAT5E COMMUNICATIONS
— — —	120/277V SWITCH LEG POWER



LIGHTING CONTROL WIRING DIAGRAM

NO SCALE

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WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
ELECTRICAL DETAILS

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
E0.02

6/26/2019 1:28 PM
p: 83
BIM 360:328

PANEL: "ITA"

Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 65000
Mains Type: MLO
Mains Rating: 400 A

Notes:
PROVIDE INTEGRAL 120 KA SURGE SUSPRESSION.

CKT	Circuit Description	Trip	Poles	Notes	A	B	C	A	B	C	Notes	Poles	Trip	Circuit Description	CKT
1	RACK POWER	30 A	2	1	2000			2000			1	2	30 A	RACK POWER	2
3						2000			2000						4
5	RACK POWER	30 A	2	1			2000			2000	1	2	30 A	RACK POWER	6
7					2000			2000							8
9	RACK POWER	30 A	2	1		2000			2000		1	2	30 A	RACK POWER	10
11							2000			2000					12
13	RACK POWER	30 A	2	1	2000			2000			1	2	30 A	RACK POWER	14
15						2000			2000						16
17	RACK POWER	30 A	2	1			2000			2000	1	2	30 A	RACK POWER	18
19					2000			2000							20
21	RACK POWER	30 A	2	1		2000			2000		1	2	30 A	RACK POWER	22
23							2000			2000					24
25	RACK POWER	30 A	2	1	2000			2000			1	2	30 A	RACK POWER	26
27						2000			2000						28
29	RACK POWER	30 A	2	1			2000			2000	1	2	30 A	RACK POWER	30
31					2000			2000							32
33															34
35															36
37															38
39															40
41															42
		Total Load:			24000 VA			20000 VA							
		Total Amps:			200 A			167 A							

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
IT POWER	64000 VA	50.00%	32000 VA		
				Total Conn. Load:	64000 VA
				Total Est. Demand:	32000 VA
				Total Conn.:	200 A
				Total Est. Demand:	89 A

Notes:
1. EACH IT RACK HAS TWO RECEPTACLES. ONE FOR PRIMARY USE AND ONE AS A REDUNDANT BACK UP. BOTH WILL NOT BE USED AT THE SAME ONE. ONLY ONE LOAD WILL BE CONNECTED AT ANY TIME.

PANEL: "ITB"

Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 65000
Mains Type: MLO
Mains Rating: 400 A

Notes:
PROVIDE INTEGRAL 120 KA SURGE SUSPRESSION.

CKT	Circuit Description	Trip	Poles	Notes	A	B	C	A	B	C	Notes	Poles	Trip	Circuit Description	CKT
1	RACK POWER	30 A	2	1	2000			2000			1	2	30 A	RACK POWER	2
3						2000			2000						4
5	RACK POWER	30 A	2	1			2000			2000	1	2	30 A	RACK POWER	6
7					2000			2000							8
9	RACK POWER	30 A	2	1		2000			2000		1	2	30 A	RACK POWER	10
11							2000			2000					12
13	RACK POWER	30 A	2	1	2000			2000			1	2	30 A	RACK POWER	14
15						2000			2000						16
17	RACK POWER	30 A	2	1			2000			2000	1	2	30 A	RACK POWER	18
19					2000			2000							20
21	RACK POWER	30 A	2	1		2000			2000		1	2	30 A	RACK POWER	22
23							2000			2000					24
25	RACK POWER	30 A	2	1	2000			2000			1	2	30 A	RACK POWER	26
27						2000			2000						28
29	RACK POWER	30 A	2	1			2000			2000	1	2	30 A	RACK POWER	30
31					2000			2000							32
33															34
35															36
37															38
39															40
41															42
		Total Load:			24000 VA			20000 VA							
		Total Amps:			200 A			167 A							

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
IT POWER	64000 VA	50.00%	32000 VA		
				Total Conn. Load:	64000 VA
				Total Est. Demand:	32000 VA
				Total Conn.:	200 A
				Total Est. Demand:	89 A

Notes:
1. EACH IT RACK HAS TWO RECEPTACLES. ONE FOR PRIMARY USE AND ONE AS A REDUNDANT BACK UP. BOTH WILL NOT BE USED AT THE SAME ONE. ONLY ONE LOAD WILL BE CONNECTED AT ANY TIME.

PANEL: "MDP"

Supply From:
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 65000
Mains Type: MLO
Mains Rating: 800 A

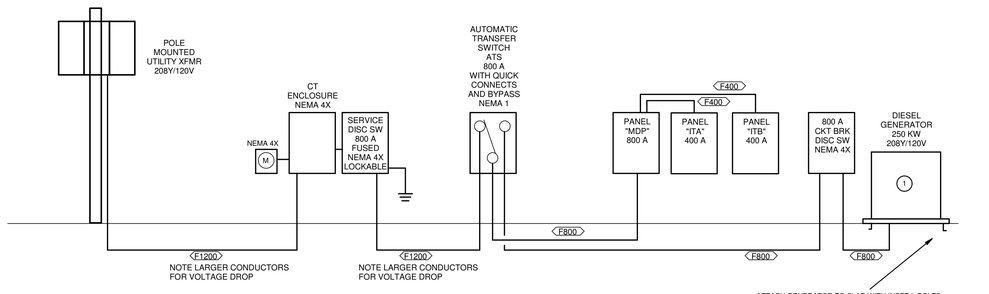
Notes:
PROVIDE INTEGRAL 200 KA SURGE SUSPRESSION

CKT	Circuit Description	Trip	Poles	Notes	A	B	C	A	B	C	Notes	Poles	Trip	Circuit Description	CKT
1					24000			24000							2
3	PANEL ITA	400 A	3	1		20000			20000		1	3	400 A	PANEL ITB	4
5							20000			20000					6
7	RECEPTACLE	20 A	1		800			800				1	20 A	RECEPTACLE	8
9	UV-1	20 A	1	2		1500			360		2	1	20 A	EF-1	10
11															12
13															14
15	RECEPTACLE	20 A	1			600			400			1	20 A	RECEPTACLE	16
17							16333			16333					18
19	CRAC-2	175 A	3	2	16333			16333			2	3	175 A	CRAC -1	20
21						16333			16333						22
23							1667			1667					24
25	CU-2	20 A	3	2	1667			1667			2	3	20 A	CU-1	26
27						1667			1667						28
29							16333			1667					30
31	FUTURE CRAC	175 A	3	3	16333			1667			4	3	20 A	FUTURE CU	32
33						16333			1667						34
35	LIGHTING	20 A	1				894								36
37															38
39															40
41															42
		Total Load:			103600 VA			96860 VA		94894 VA					
		Total Amps:			866 A			810 A		791 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	109860 VA	100.00%	109860 VA		
LIGHTING	588 VA	100.00%	588 VA	**Total Conn. Load:**	295354 VA
EXTERIOR LIGHTING	306 VA	100.00%	306 VA	**Total Est. Demand:**	231354 VA
RECEPTACLE	2600 VA	100.00%	2600 VA	**Total Conn.:**	866 A
Spare	54000 VA	100.00%	54000 VA	**Total Est. Demand:**	642 A
IT POWER	128000 VA	50.00%	64000 VA		

Notes:
1. CONTAINS LOADS REDUNDANT WITH LOADS ON OTHER PANELBOARDS. ONLY ONE LOAD PER IT RACK WILL BE ON AT ANY GIVEN TIME.
2. VERIFY BREAKER SIZE WITH EQUIPMENT MANUFACTURER.
3. CONTRACTOR SHALL INSTALL CONDUIT FROM PANEL TO ACCESSIBLE LOCATION BELOW FLOOR FOR FUTURE CONNECTION TO UNIT.
4. CONTRACTOR SHALL ISNTALL CONDUIT FROM PANEL TO ACCESSIBLE LOCTION OUTSIDE BUILDING FOR FUTURE CONNECTION. CONTRACTOR SHALL CAP CONDUIT TO MAKE WATER TIGHT.



ELECTRICAL RISER DIAGRAM

NO SCALE

GENERAL NOTES

A VERIFY THE EXACT LOCATION OF ALL ELECTRICAL EQUIPMENT AT THE SITE.

B VERIFY ALL POWER COMPANY REQUIREMENTS WITH THE POWER COMPANY PRIOR TO BID. INCLUDE ALL POWER COMPANY SERVICES COSTS IN THE ELECTRICAL BID NUMBER.

C VERIFY ALL ELECTRICAL SERVICE METERING REQUIREMENTS WITH THE POWER COMPANY. PROVIDE ALL LABOR AND MATERIALS NECESSARY TO PROVIDE THE METERING CONNECTIONS REQUIRED BY THE POWER COMPANY.

D WHERE FEEDER SIZES ARE NOT INDICATED, FEEDER SHALL MATCH THE ASSOCIATED OVERCURRENT PROTECTIVE DEVICE AS INDICATED ON THE BRANCH CIRCUIT AND SERVICE CONDUCTOR SIZING SCHEDULE.

E PROVIDE 4" CONCRETE HOUSEKEEPING PADS UNDER ALL DRY TYPE TRANSFORMERS. REFER TO THE TRANSFORMER SCHEDULE FOR TRANSFORMER SIZE AND ALL PRIMARY, SECONDARY AND GROUNDING CONDUCTOR SIZES.

NOTES INDICATED BY "◯"

1 GENERATOR SHALL BE SIZED TO HANDLE LOAD. NOTE THAT PANEL ITA AND ITB ARE REDUNDANT. ONLY ONE FULL LOAD WILL BE RUNNING AT ANY GIVEN TIME. NO MORE THAN TWO CRAC UNITS AND TWO CUs WILL RUN AT ANY GIVEN TIME AND WILL ALL HAVE A DELAYED START. GENERATOR SHALL HAVE A SOUND ENCLOSURE TO HAVE NO MORE THAN 65 dB AT 70'. CALCULATIONS MUST ONLY TAKE INTO ACCOUNT GENERATOR ENCLOSURE. GENERATOR YARD ENCLOSURE MAY NOT BE USED TO CALCULATE SOUND. GENERATOR MUST FIT IN FOOTPRINT SHOWN.

JAMES HOLLOWAY
114321
05/23/19

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
ELECTRICAL RISER DIAGRAM

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
E0.03

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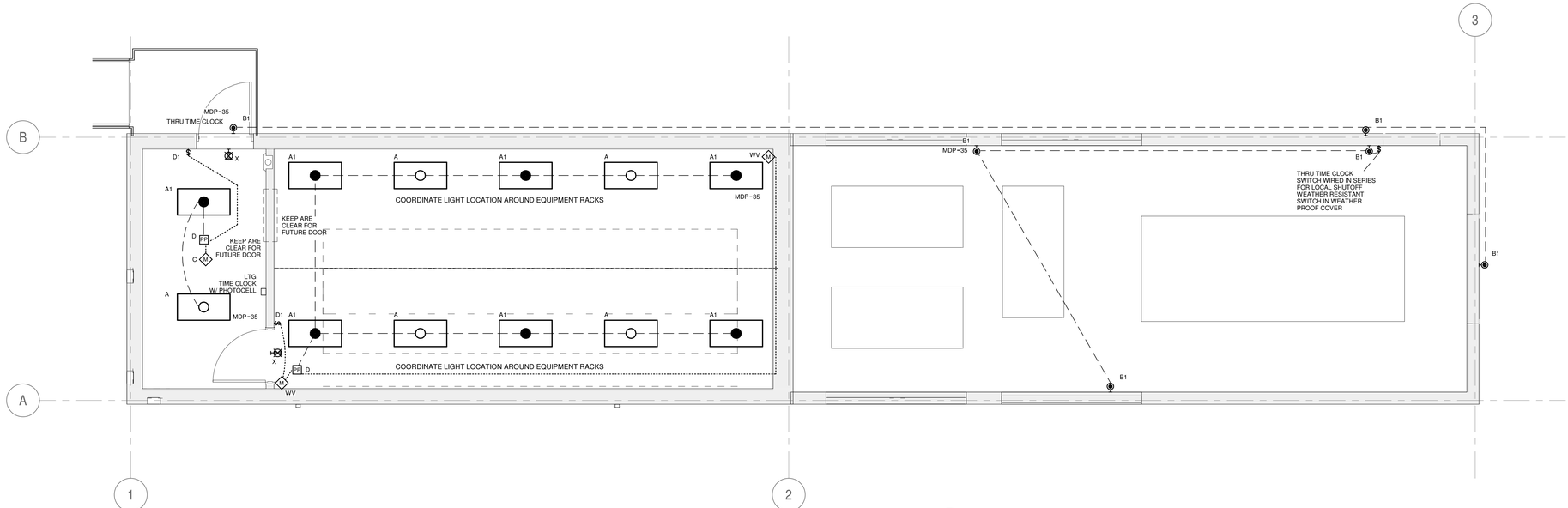
GENERAL NOTES

A VERIFY THE EXACT LOCATION OF ALL LIGHT FIXTURES WITH THE ARCHITECTURAL REFLECTED CEILING PLAN.

B INSTALL A CONTINUOUS, NON-SWITCHED HOT CONNECTION TO ALL NEW EMERGENCY DRIVERS AND EXIT SIGNS. CONNECT ALL EXIT SIGNS TO THE NEAREST CONTINUOUSLY HOT LIGHTING CIRCUIT.

C VERIFY THE EXACT MOUNTING HEIGHT OF ALL WALL MOUNTED ELECTRICAL DEVICES AND FIXTURES WITH THE ARCHITECTURAL ELEVATIONS.

D ALL OCCUPANCY SENSORS, WITH THE EXCEPTION OF THE FOLLOWING LOCATIONS, SHALL BE SET TO VACANCY MODE FOR MANUAL ON-AUTOMATIC OFF: CORRIDORS, STAIRS, RESTROOMS, BUILDING PRIMARY ENTRANCES, LOBBIES AND OTHER AREAS AS INDICATED ON THE PLAN.



FLOOR PLAN - LIGHTING

SCALE: 1/4" = 1'-0"

NORTH

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
FLOOR PLAN - LIGHTING

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
E2.01

STATE OF TEXAS
JAMES HOLLOWAY
114321
REGISTERED PROFESSIONAL ENGINEER
06/25/19

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GENERAL NOTES

A PROVIDE 3/4" CONDUIT TO 6" ABOVE THE NEAREST ACCESSIBLE CEILING OR TO THE STRUCTURE IN OPEN CEILING AREAS AT EACH COMMUNICATIONS DEVICE INDICATED.

B VERIFY ALL DEVICE MOUNTING HEIGHTS FOR DEVICES LOCATED IN MILLWORK WITH ARCHITECTURAL ELEVATIONS. FOR ALL DEVICES NOT INDICATED ON THE ARCHITECTURAL ELEVATIONS, VERIFY THE EXACT LOCATION AND MOUNTING HEIGHT WITH THE ARCHITECT PRIOR TO INSTALLATION.

C VERIFY THE EXACT LOCATION OF ALL FLOOR MOUNTED DEVICES WITH THE ARCHITECT AND/OR OWNER PRIOR TO ROUGH-IN INSTALLATION.

D CONTRACTOR SHALL PROVIDE AND INSTALL A LIGHTNING PROTECTION SYSTEM FOR IT BUILDING, GENERATOR YARD, AND GENERATOR YARD EQUIPMENT. SEE SPECIFICATIONS SECTION 26.41.13 FOR REQUIREMENTS.

E CONTRACTOR SHALL INSTALL ALL CONDUITS AND BACK BOXES NOTED ON TECHNOLOGY AND SECURITY DRAWINGS. SEE TECHNOLOGY AND SECURITY DRAWINGS FOR SIZES AND ROUTINGS.

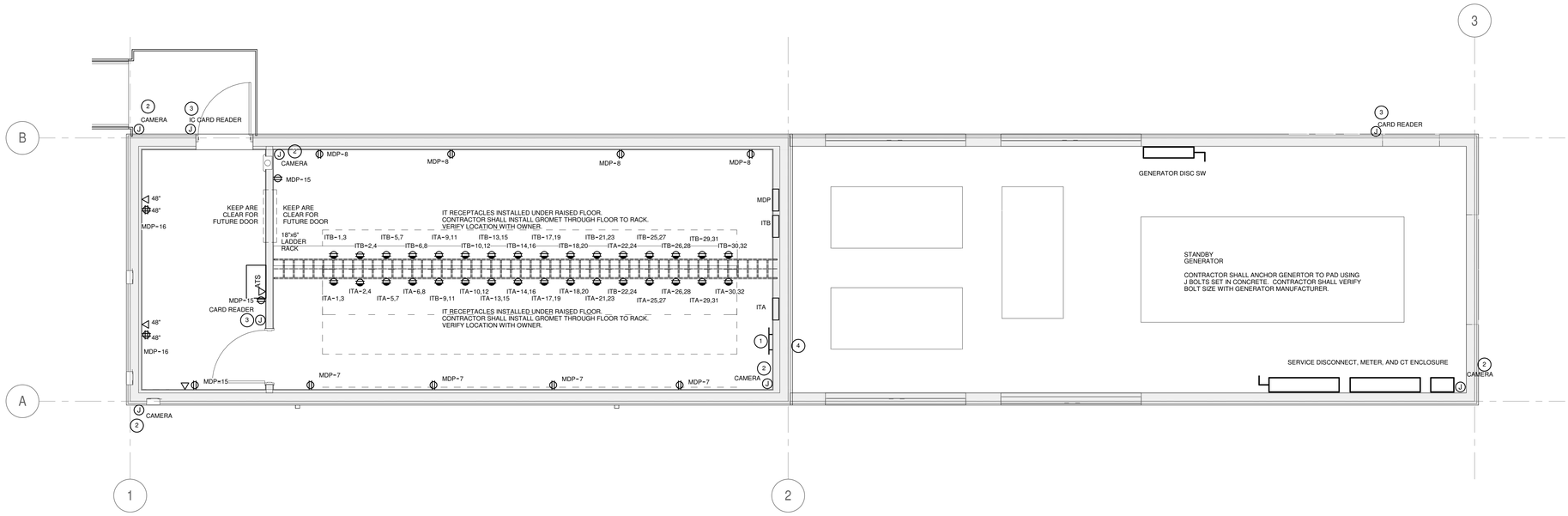
NOTES INDICATED BY "◯"

1 24" x 20" x 1/4" GROUNDING BUS BAR WITH GROUNDING ELECTRODES TIED TO EACH OF THE 16 RACKS AND TO PANEL MDP.

2 JUNCTION BOX TO SERVE CAMERA. VERIFY CONDUIT ROUTING AND REQUIREMENTS WITH SECURITY DRAWINGS. CONDUIT SHALL EXTEND TO ACCESSIBLE LOCATION INSIDE IT BUILDING.

3 JUNCTION BOX TO SERVE CARD READER. VERIFY CONDUIT ROUTING AND REQUIREMENTS WITH SECURITY DRAWINGS. CONDUIT SHALL EXTEND TO ACCESSIBLE LOCATION INSIDE IT BUILDING.

4 CONTRACTOR SHALL INSTALL THREE SLEEVES AND WEATHERHEADS FOR EXTERIOR COMMUNICATIONS EQUIPMENT. COORDINATE SIZE AND LOCATION WITH IT DRAWINGS.



FLOOR PLAN - POWER & COMMUNICATION

SCALE: 1/4" = 1'-0"

NORTH

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

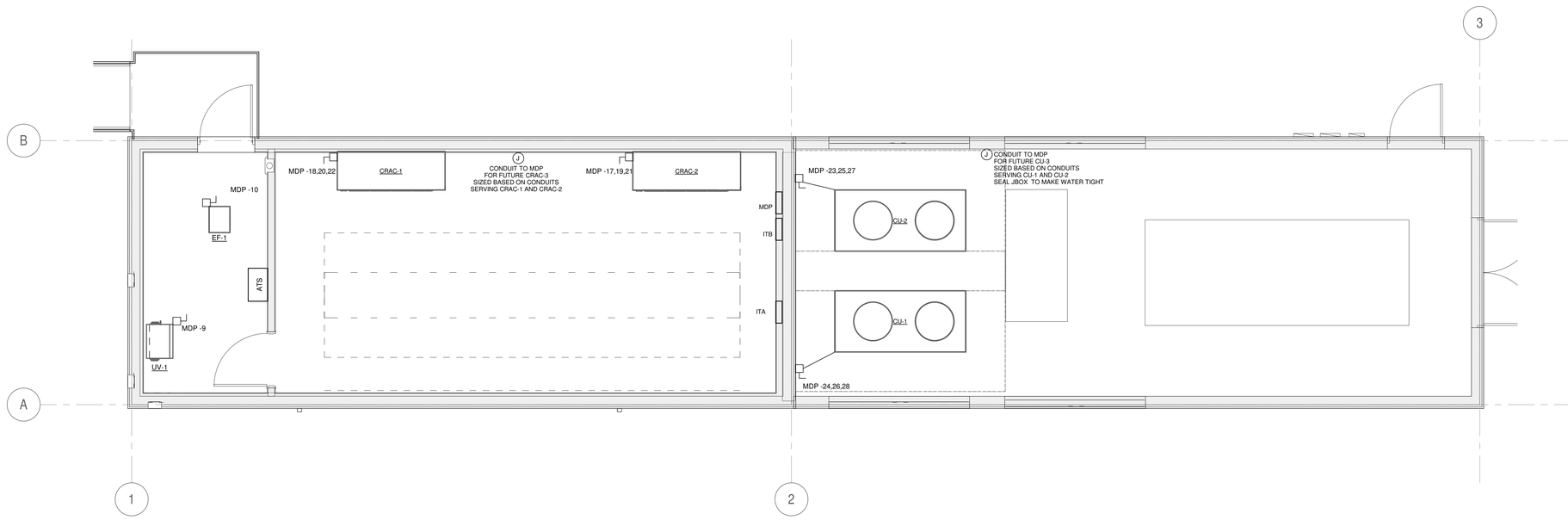
SHEET CONTENTS:
FLOOR PLAN - POWER & COMMUNICATIONS

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
E3.01

Bid Set 19-328



FLOOR PLAN - HVAC POWER

SCALE: 1/4" = 1'-0"

NORTH

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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
FLOOR PLAN - HVAC POWER

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
E4.01

STATE OF TEXAS
JAMES HOLLOWAY
114321
REGISTERED
05/23/19

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BACKBONE AND BONDING RISER

GENERAL NOTES:

1.) CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING FOOTAGES PRIOR TO PROCURING MATERIALS.

2.) CABLE IS CONTINUOUS IN NATURE FROM END–TO–END (UN–SPLICED), UNLESS NOTED OTHERWISE.

3.) ALL CABLING SHALL BE RATED FOR THE ENVIRONMENT IN WHICH IT WILL RESIDE.

4.) ALL FIBER STRANDS SHALL BE FUSION SPLICED, TESTED, AND LABELED.

KEYED NOTES:

(1) RECOMMENDED MAXIMUM RESISTANCE EQUAL OR LESS THAN 5 OHMS.

(2) STRANDED COPPER INSULATED CONDUCTOR, #4/0 TO BUILDING'S ELECTRICAL SERVICE MAIN GROUNDING ELECTRODE SYSTEM SIZED TO TEST TO EQUAL TO OR LESS THAN 0.1 OHM. ROUTE CONDUCTOR TO ELECTRICAL SERVICE WITH FEWEST BENDS AS PRACTICAL. LABEL EACH END OF CONDUCTOR WITH ROOM NUMBER TO WHICH CABLE IS ROUTED. BOND GROUND CONDUCTOR TO GROUND WITH EXOTHERMIC WELD.

(3) MINIMUM #3/0 INSULATED AND STRANDED COPPER. TEST TO 0.1 OHM. BOND GROUND CONDUCTOR TO CONDUCTOR AND/OR BUSBAR WITH EXOTHERMIC WELD.

(4) TO DEDICATED ELECTRICAL PANEL GROUND IN DATA/TEL, IF AVAILABLE.

(5) MINIMUM #2/0 AWG TO BUILDING STEEL, IF AVAILABLE.

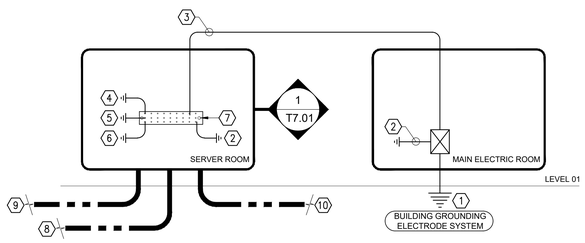
(6) BONDING COPPER CONDUCTOR (SIZE #2/0 AWG) FROM BUSBAR TO EACH ROW OF EQUIPMENT RACKS, ALONG ENTIRE LENGTH OF ROW. BOND EACH RACK TO BONDING CONDUCTOR WITH A #6 AWG STRANDED BONDING COPPER CONDUCTOR WITH 2–HOLE CRIMP LUGS AND H–TAPS. (TYP)

(7) NEMA RATED PBB ¼" X 4" X 20" WITH STAND OFF INSULATORS. BOND GROUND CONDUCTOR TO PBB WITH EXOTHERMIC WELD. REFER TO ROOM DETAIL DRAWINGS FOR FINAL LOCATION.

(8) MINIMUM 48–STRAND SINGLE MODE OSP RATED FIBER OPTIC CABLE. PROVIDE 75 FOOT SLACK AT RISER POLE AND BUILDING ENTRANCE. (SPLICING AND TERMINATION BY OWNER)

(9) 48–STRAND SINGLE MODE INDOOR OUTDOOR RATED FIBER OPTIC CABLE TO ATTIC OF COURTHOUSE ANNEX. PROVIDE 10 FOOT SERVICE LOOP TERMINATE AND TEST BOTH ENDS. APPROXIMATE FOOTAGE OF 400', VERIFY ACTUAL FOOTAGE PRIOR TO BID.

(10) 48–STRAND SINGLE MODE INDOOR OUTDOOR RATED FIBER OPTIC CABLE TO JAIL. PROVIDE 10 FOOT SERVICE LOOP TERMINATE AND TEST BOTH ENDS. APPROXIMATE FOOTAGE OF 1100', VERIFY ACTUAL FOOTAGE PRIOR TO BID.



GENERAL NOTES

GENERAL CONTRACTOR/CONSTRUCTION MANAGER NOTES:

1.) THE GENERAL CONTRACTOR/CONSTRUCTION MANAGER IS RESPONSIBLE TO ENSURE THAT ALL DIVISIONS AND TRADES ARE AWARE OF WORK REQUIRED TO SUPPORT THE INSTALLATION OF RELATED SYSTEMS AND SUB–SYSTEMS. CONTRACTORS ARE RESPONSIBLE TO REVIEW ALL RELATED SPECIFICATIONS AND DRAWINGS.

2.) PROVIDE AND INSTALL WALL MOUNTED ¾" AC GRADE FIRE RESISTANT PLYWOOD IN ALL COMMUNICATIONS ROOMS AND CLOSETS ON ALL WALLS. APPLY INTUMESCENT COATING TO BOTH SIDES OF PLYWOOD, ENSURE FIRE RESISTANT STAMP IS VISIBLE FOR INSPECTION ON EACH SHEET OF PLYWOOD. INTUMESCENT COATING SHALL BE IBC/NFPA CODE COMPLIANT, IN ACCORDANCE WITH UL 263 AND ASTM E119, TO MEET 1 OR 2 HOUR FIRE PROTECTION REQUIREMENT. REFERENCE COMMUNICATIONS ROOM DETAILS.

3.) CABLE TRAY, SLEEVES, BOXES, POWER, AND CONDUITS SHOWN ON COMMUNICATIONS DRAWINGS ARE FOR COORDINATION ONLY. REFER TO ELECTRICAL DRAWINGS AND SPECIFICATIONS.

ELECTRICAL CONTRACTOR NOTES:

1.) THE ELECTRICAL CONTRACTOR SHALL FURNISH AND PROVIDE THE FOLLOWING FOR COMMUNICATIONS CABLING: CABLE TRAY, CONDUIT, SLEEVES, WALL, AND FLOOR BOXES REFER TO THE ELECTRICAL AND COMMUNICATIONS DETAIL DRAWINGS.

A.) STANDARD DATA AND VOICE SERVICE BOXES FOR COMMUNICATIONS SHALL BE A FLUSH 4¹⁄₁₆" SQ DEEP BOX (2⅛" MIN) WITH SINGLE GANG REDUCTION PLATE AND A 1"ø CONDUIT FROM BOX TO ACCESSIBLE CEILING SPACE.

B.) WALL MOUNTED TELEPHONE OUTLET SHALL BE A FLUSH 4¹⁄₁₆" SQ DEEP BOX (2⅛" MIN) WITH SINGLE GANG REDUCTION PLATE AND A 1"ø CONDUIT FROM BOX TO ACCESSIBLE CEILING SPACE. MOUNT BOX 48" AFF OR AS REQUIRED BY ADA.

C.) CEILING BOXES FOR COMMUNICATIONS OUTLETS SHALL BE A 4¹⁄₁₆" SQ DEEP BOX (2⅛" MIN) WITH A SINGLE GANG REDUCTION PLATE, AND A 1"ø CONDUIT FROM EACH BOX TO ACCESSIBLE CEILING SPACE.

D.) BOXES FOR WIRELESS DEVICES MOUNTED ABOVE LAY–IN CEILINGS SHALL BE A 4¹⁄₁₆"SQ DEEP BOX (2⅛" MIN) WITH SINGLE GANG REDUCTION PLATE (TYP).

2.) CONTRACTOR SHALL PROVIDE RACEWAY INSTALLATION IN A MANNER THAT WILL PROTECT ALL DATA/VOICE/FIBER CABLING FROM MECHANICAL DAMAGE. INSTALL CONDUITS FOR COMMUNICATIONS WITH LONG RADIUS BENDS, BUSHED ENDS THAT ARE GROUNDED AND BONDED AS PER CODES AND STANDARDS.

3.) CONTRACTOR SHALL COORDINATE WITH THE GENERAL CONTRACTOR AND COMMUNICATIONS TRADE ON CONDUIT AND CABLE TRAY ROUTING FOR COMMUNICATIONS CABLES PRIOR TO INSTALLATION OF PATHWAYS TO ENSURE CABLE PATHWAYS DO NOT CAUSE CABLE LENGTHS TO EXCEED MAXIMUM DISTANCES. IN GENERAL, CONDUITS FROM CABLE TRAY TO TELECOM OUTLETS SHOULD BE THE MOST DIRECT ROUTE POSSIBLE FOLLOWING BUILDING LINES.

4.) CONTRACTOR SHALL INSTALL A TIED OFF NYLON PULL STRING IN ALL CONDUITS.

5.) INSTALL THE CABLE TRAY WITH A MIN. 12" CLEARANCE ABOVE AND ON ONE SIDE OF TRAY. INSTALL SOLID BOTTOM TRAY WHERE IS PLACED ABOVE LIGHT FIXTURES.

6.) CONDUITS SHALL NOT EXCEED 180° OF BENDS BETWEEN PULL POINTS. INSTALL PERMANENTLY ACCESSIBLE PULL BOXES AS REQUIRED TO MEET THIS REQUIREMENT. DO NOT CHANGE DIRECTION OR BEND WITHIN A JUNCTION BOX OR PULL BOX.

7.) GROUNDING AND BONDING:

A.) BUILDING GROUNDING SYSTEM BY ELECTRICAL CONTRACTOR.

B.) ALL PATHWAYS INSTALLED FOR COMMUNICATIONS SHALL BE BONDED TO COMMUNICATION GROUND BUS BARS.

C.) REFER TO ELECTRICAL SERIES DRAWINGS AND SPECIFICATIONS FOR OTHER COMMUNICATION GROUNDING REQUIREMENTS AND INFO ON INSTALLATION OF MATERIALS AND HARDWARE.

D.) DISSIMILAR METALS BONDED TO EACH OTHER AND APT TO CORRODE IN NORMAL ENVIRONMENTAL CONDITIONS SHALL BE SEPARATED BY A CONDUCTIVE MATERIAL SPACER TO PREVENT CORROSION. REFER TO SPECIFICATIONS FOR OTHER GROUNDING REQUIREMENTS.

E.) BUS BARS SHALL BE PRE–DRILLED WITH STANDARD NEMA BOLT HOLE SIZING & SPACING FOR CONNECTIONS OF THE BONDING CONDUCTORS TO THE BUSBAR.

8.) IDENTIFICATION:

A.) SPRAY ALL BOXES AND CONDUIT FOR COMMUNICATIONS WITH A DISTINCTIVE COLOR FOR EASY IDENTIFICATION. COLOR SHALL BE DIFFERENT FROM OTHER TRADES.

COMMUNICATION NOTES

1.) THE TELECOMMUNICATIONS CONTRACTOR SHALL REVIEW ALL CONSTRUCTION DOCUMENTS FOR RELATED SECTIONS, WHICH MAKE UP THE CONTRACT DOCUMENTS AND SHALL COORDINATE ALL COMMUNICATIONS WORK ON THE COMMUNICATIONS PLANS WITH ANY COMMUNICATIONS SECTIONS OF RELATED DRAWINGS AND SPECIFICATIONS.

A.) STRUCTURED CABLING REQUIREMENTS FOR THE PROJECT ARE THE RESPONSIBILITY OF THE COMMUNICATIONS CABLING CONTRACTOR UNLESS OTHERWISE NOTED. COORDINATE WITH ALL TRADES THAT APPLY. REFER TO MEP, AUDIOVISUAL, AND SECURITY SHEETS FOR ADDITIONAL CABLING REQUIREMENTS.

2.) TELECOMMUNICATIONS CONTRACTOR, CABLING CONTRACTOR, OR COMMUNICATIONS CONTRACTOR SHALL HERE AFTER BE REFERRED TO AS CONTRACTOR UNLESS OTHERWISE NOTED.

3.) CONTRACTOR SHALL PROVIDE ALL MATERIALS, COMPONENTS, TOOLS, AND LABOR NECESSARY TO COMPLETE THIS INFRASTRUCTURE INSTALLATION.

4.) ALL COMMUNICATIONS CABLING PATHWAYS OUTSIDE OF COMMUNICATIONS ROOMS BY ELECTRICAL CONTRACTOR.

5.) CONTRACTOR SHALL PROVIDE 'J' HOOKS ON THREADED ROD RATED FOR SUPPORTING DATA CABLING THAT IS NOT IN CONDUIT OR CABLE TRAY. CONTRACTOR SHALL COORDINATE WITH GENERAL CONTRACTOR ON CABLE PATHS PRIOR TO INSTALLATION OF CABLING.

COMMUNICATIONS CABLING:

1.) ALL UTP HORIZONTAL CABLING MUST BE WITHIN A PHYSICAL LENGTH OF 295'.

2.) PROVIDE ALL NECESSARY MEANS TO PROTECT ALL COPPER/FIBER CABLING AND JACK/PORTS FROM MECHANICAL DAMAGE AND DUST DURING CONSTRUCTION.

3.) FIBER BACKBONE/RISER CABLE SHALL BE INSTALLED IN CONDUIT OR ON LADDER RUNWAY UNLESS IT IS ARMORED.

4.) COORDINATE WITH GENERAL CONTRACTOR FOR SYSTEM FURNITURE WORKSTATIONS TO PROVIDE REQUIRED BRACKETS TO INSTALL AND TERMINATE COMMUNICATIONS CABLING, JACKS AND FACE PLATES.

5.) CABLING CONTRACTOR RESPONSIBLE FOR FINAL CONNECTION, TERMINATION AND TESTING TO THE DATA OUTLETS IN LAB BENCHES AND MODULAR FURNITURE, INCLUSIVE OF PATCH CORD ROUTING.

6.) CABLING CONTRACTOR SHALL CONFIRM ALL CABLE LENGTHS PRIOR TO BID AND ROUGH–IN

COMMUNICATIONS ROOMS:

1.) CONTRACTOR TO PROVIDE EQUIPMENT RACKS, HORIZONTAL CABLE RUNWAYS AND MANAGERS, VERTICAL CABLE MANAGERS, TERMINATION HARDWARE, POWER STRIPS FOR RACKS, TERMINATION, LABELING, AND TESTING AS SPECIFIED IN CONTRACT DOCUMENTS.

2.) GRAPHIC REPRESENTATION OF PATCH PANELS, BLOCKS, VERTICAL, AND HORIZONTAL CORD MANAGEMENT DO NOT REPRESENT EXACT QUANTITIES. CONTRACTOR SHALL PROVIDE SUFFICIENT QUANTITIES FOR ALL CABLING, PLUS 20% GROWTH. (REFER ALSO TO SPECIFICATIONS).

GROUNDING AND BONDING:

1.) CONTRACTOR SHALL BOND ALL METALLIC COMPONENTS TO BUSBAR IN THE FOLLOWING MANNER:

A.) CONTRACTOR SHALL INSTALL A CONTINUOUS BONDING CONDUCTOR FROM BUSBAR TO EACH ROW OF EQUIPMENT RACKS. EXTEND CONDUCTOR ALONG ENTIRE ROW. BOND EACH RACK TO BONDING CONDUCTOR WITH AN INSULATED COPPER CONDUCTOR.

B.) BOND/STRAP ALL LADDER RACKS TO ADJACENT SECTIONS WITH A STRANDED BONDING COPPER CONDUCTOR. INSTALL A BONDING CONDUCTOR FROM BUSBAR TO LADDER RACKS.

C.) BONDING SHALL BE IN AN APPROVED MANNER.

D.) DISSIMILAR METALS BONDED TO EACH OTHER AND APT TO CORRODE IN NORMAL ENVIRONMENTAL CONDITIONS SHALL BE SEPARATED BY A CONDUCTIVE MATERIAL SPACER TO PREVENT CORROSION. REFER TO SPECIFICATIONS FOR OTHER GROUNDING REQUIREMENTS.

FIRESTOPPING:

1.) COORDINATE ANY AND ALL FIRESTOPPING WITH THE GENERAL CONTRACTOR BEFORE PROCEEDING WITH ANY WORK INVOLVING FIRESTOPPING.

2.) ALL FIRESTOPPING SHALL CONFORM TO THE SPECIFICATIONS AND RECOMMENDATIONS OF THERMAL AND MOISTURE PROTECTION ON FIRESTOPPING OF THROUGH PENETRATION SYSTEMS IN THE CONSTRUCTION SPECIFICATIONS DOCUMENT.

3.) SOLUTIONS AND SHOP DRAWINGS/SUBMITTALS FOR FIRE STOP MATERIALS AND SYSTEMS SHALL BE PRESENTED TO THE GENERAL CONTRACTOR FOR WRITTEN APPROVAL OF MATERIAL & SYSTEMS PRIOR TO PURCHASE AND INSTALLATION. ALL MATERIALS AND SYSTEMS SHALL BE COMPLETE, UL LISTED FOR INTENDED INSTALLATION, AND PROVIDE APPROPRIATE RATING AT THE COMPLETION OF JOB.

4.) SEAL ALL PENETRATIONS THROUGH FIRE–RATED BARRIERS (CONDUITS, SLEEVES, SLOTS, CHASES) CREATED BY OR MADE FOR OR ON THE BEHALF OF THE TELECOMMUNICATIONS CONTRACTOR TO PREVENT THE PASSAGE OF SMOKE, FIRE, TOXIC GAS, OR WATER THROUGH PENETRATIONS.

5.) CONTRACTOR SHALL PROVIDE TRAINING MANUALS WHICH INCLUDE INSTRUCTIONS ON METHODS OF ADDING OR REMOVING CABLING TO/FROM FIRESTOPPED SLEEVES AND CHASES.

6.) LAMINATE AND PERMANENTLY AFFIX TO EACH COMMUNICATIONS ROOM WALL ADJACENT TO CHASES THE FOLLOWING INFORMATION:

A.) NAME OF MANUFACTURER OF FIRE STOP SYSTEM.

B.) PART & MODEL NUMBERS OF SYSTEM AND ALL COMPONENTS.

C.) PHONE NUMBERS OF MANUFACTURER'S CORPORATE HEADQUARTERS IN U.S. AND LOCAL DISTRIBUTOR'S NAME AND NUMBER.

LEGEND

#D/V WALL DATA INFORMATION OUTLET. NUMBER(#) DENOTES QUANTITY OF CABLES.

W/V WALL PHONE (VOICE) OUTLET AT 48" AFF.

WAP DATA OUTLET FOR WIRELESS ACCESS POINT (WAP) CONNECTIVITY ABOVE LAY–IN CEILING. TERMINATE WITH MODULAR CONNECTORS AND LABEL.

10,S/V WALL DATA OUTLET FOR IP CAMERA. REFER TO SECURITY DRAWINGS AND SPECIFICATIONS FOR EXACT PLACEMENT.

10,S/D CEILING DATA OUTLET FOR IP CAMERA. REFER TO SECURITY DRAWINGS AND SPECIFICATIONS FOR EXACT PLACEMENT.

ABBREVIATIONS

BAS:	BUILDING AUTOMATION SYSTEM
BET:	BUILDING ENTRANCE TERMINAL
DIV 01:	GENERAL REQUIREMENTS
DIV 07:	THERMAL & MOISTURE PROTECTION
DIV 23:	HEATING, VENTILATING, AND AIR–CONDITIONING
DIV 25:	INTEGRATED AUTOMATION
DIV 26:	ELECTRICAL
TR:	TELECOMMUNICATIONS ROOM
ER:	EQUIPMENT ROOM
TBB:	TELECOM BONDING BACKBONE
TBC:	TELECOM BONDING CONDUCTOR
SBB:	SECONDARY BONDING BUSBAR
TMBC:	TELECOM MAIN BONDING CONDUCTOR
PBB:	PRIMARY BONDING BUSBAR
TMH:	TELECOMMUNICATIONS MANHOLE
UTP:	UNSHIELDED TWISTED PAIR
WAP:	WIRELESS ACCESS POINT

DRAWING LIST

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SHEET CONTENTS:
LEGEND AND NOTES - COMMUNICATIONS
DATE:
05/23/2019
JOB NO.:
18465.01
SHEET:
T0.01

6/20/2019 1:29 PM

Bid 1906-328
Williamson County, Texas
Who: Fernando Trevino
When: Jun 20, 2019 - 1:29pm
Where:P:\Austin\WIlco - Server Room\Datacom-Construction\T0.01.dwg
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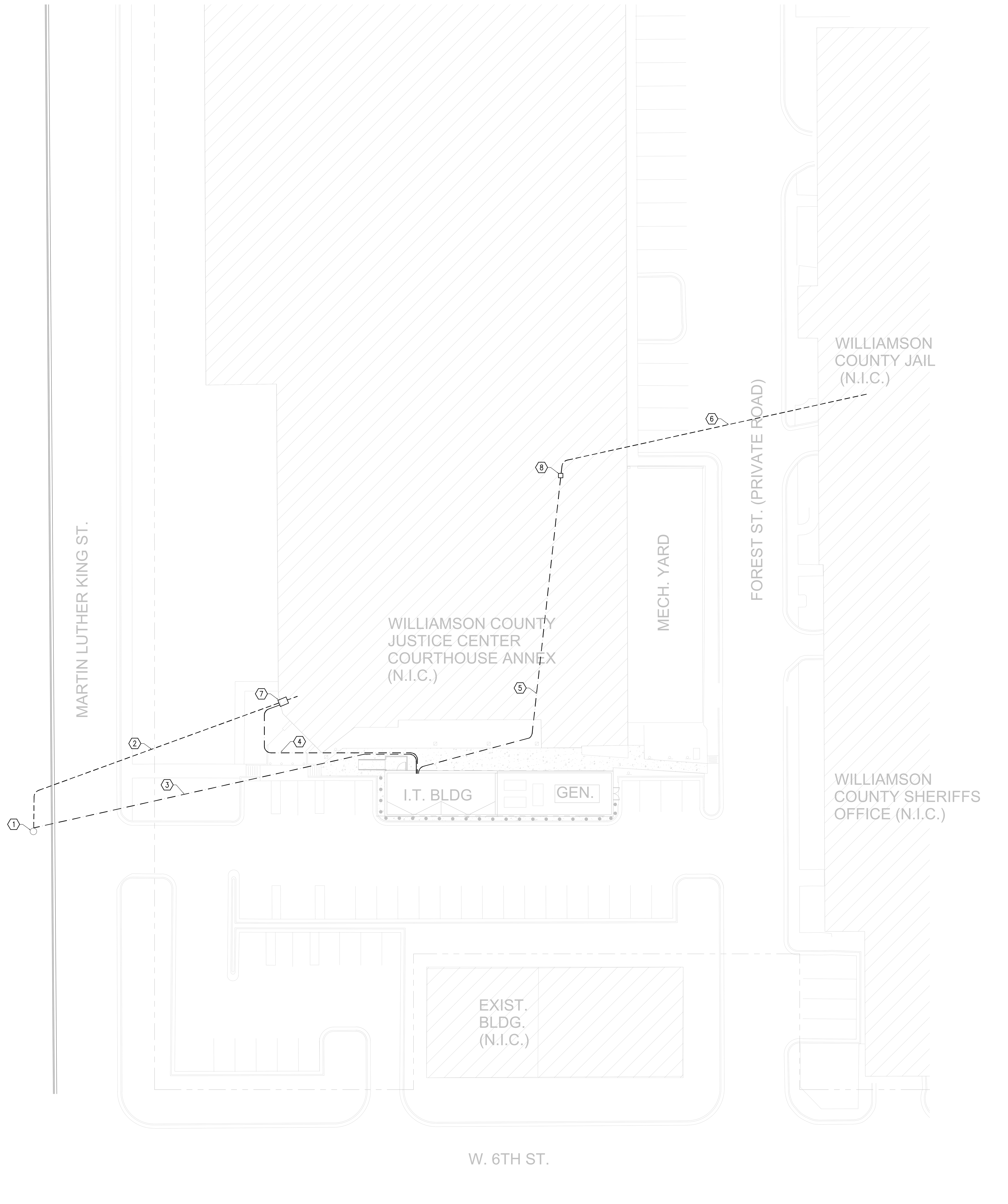

SITE PLAN - COMMUNICATIONS

SCALE: 1" = 20'-0"

GENERAL NOTES:

1.) ALL COMMUNICATIONS CABLING SHALL BE RATED FOR THE ENVIRONMENT IN WHICH IT RESIDES.

2.) CONDUIT ROUTING IS CONCEPTUAL. CONTRACTOR TO COORDINATE FINAL ROUTING OF CONDUITS WITH OTHER UTILITIES.

3.) PROVIDE PULLBOXES AS REQUIRED, SIZED PER THE NEC.

4.) REFER TO ELECTRICAL AND CIVIL SITE PLANS FOR ADDITIONAL INFORMATION.

5.) FIELD VERIFY ALL DISTANCES, CONDITIONS AND REQUIREMENTS FOR PROPOSED AND EXISTING PATHWAYS SHOWN.

6.) OUTSIDE PLANT CONDUIT AND TELECOMMUNICATION HANDHOLE LOCATIONS SHOWN FOR REFERENCE ONLY. VERIFY EXACT PLACEMENT WITH FIELD CONDITIONS, CIVIL AND ARCHITECTURAL DRAWINGS.

7.) PLUG ALL POPULATED AND SPARE OSP CONDUITS AFTER CABLE PLACEMENT.

KEYED NOTES:

1. APPROXIMATE LOCATION OF EXISTING RISER POLE.
2. APPROXIMATE LOCATION OF EXISTING 2"ø CONDUIT PATHWAY TO JUSTICE CENTER.
3. FOUR (4) 4"ø CONDUITS W/ THREE (3) 4" 3 CELL FABRIC INNERDUCTS IN EACH. FROM RISER POLE TO SERVER ROOM.
4. ONE (1) 4"ø CONDUIT W/ THREE (3) 4" 3 CELL FABRIC INNERDUCTS FROM SERVER ROOM TO NEW HANDHOLE. PLACE 48-STRAND SINGLE MODE THEN CONTINUE THROUGH EXISTING 2"ø RISER CONDUIT TO ATTIC.
5. ONE (1) NEW 4"ø CONDUIT W/ THREE (3) 4" 3 CELL FABRIC INNERDUCTS FROM SERVER ROOM THROUGH CRAWL SPACE. TIE INTO EXISTING COMMUNICATIONS PATHWAY TO JAIL. PLACE 48-STRAND SINGLE MODE THROUGH NEW CONDUIT THEN CONTINUE THROUGH EXISTING CONDUIT TO JAIL.
6. APPROXIMATE LOCATION OF EXISTING COMMUNICATIONS PATHWAY TO JAIL.
7. INTERCEPT EXISTING CONDUIT AND PLACE NEW 3'X4' HANDHOLE.
8. PLACE NEW 24"X24"X8" PULLBOX AT INTESECTION OF NEW AND EXISTING CONDUIT. MOUNTED TIGHT TO DECK. COORDINATE LOCATION WITH DIV.26.

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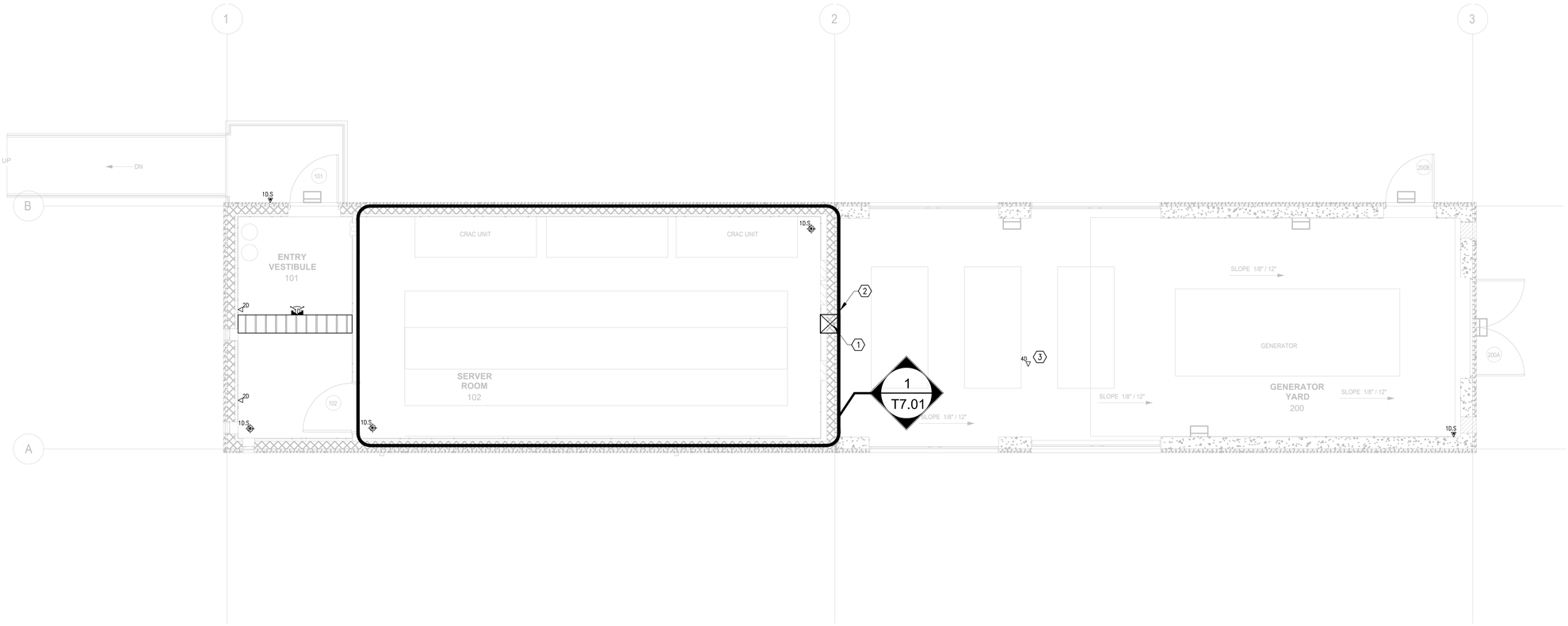
Bid 1906-328

Williamson County, Texas

KEYED NOTES:

1. FRAME AND FINISH AREA. INSTALL 1X3 WAVEGUIDE ENTRY PLATE FOR ANTENNA PASS–THROUGH.
2. LOCATION FOR RIGID PIPE MOUNTED TO THE WALL TO BE USED AS ANTENNA MAST. COORDINATE LOCATION AND REQUIREMENTS WITH OWNER, STRUCTURAL AND ARCHITECT.
3. COORDINATE FINAL DATA CONNECTIVITY TERMINATIONS FOR GENERATOR CONTROLS. CABLING SHALL BE ROUTED TO SERVER ROOM FROM TERMINATION POINT IN 1¼"ø CONDUIT.



FLOOR PLAN - COMMUNICATIONS

SCALE: 1/4" = 1'-0"

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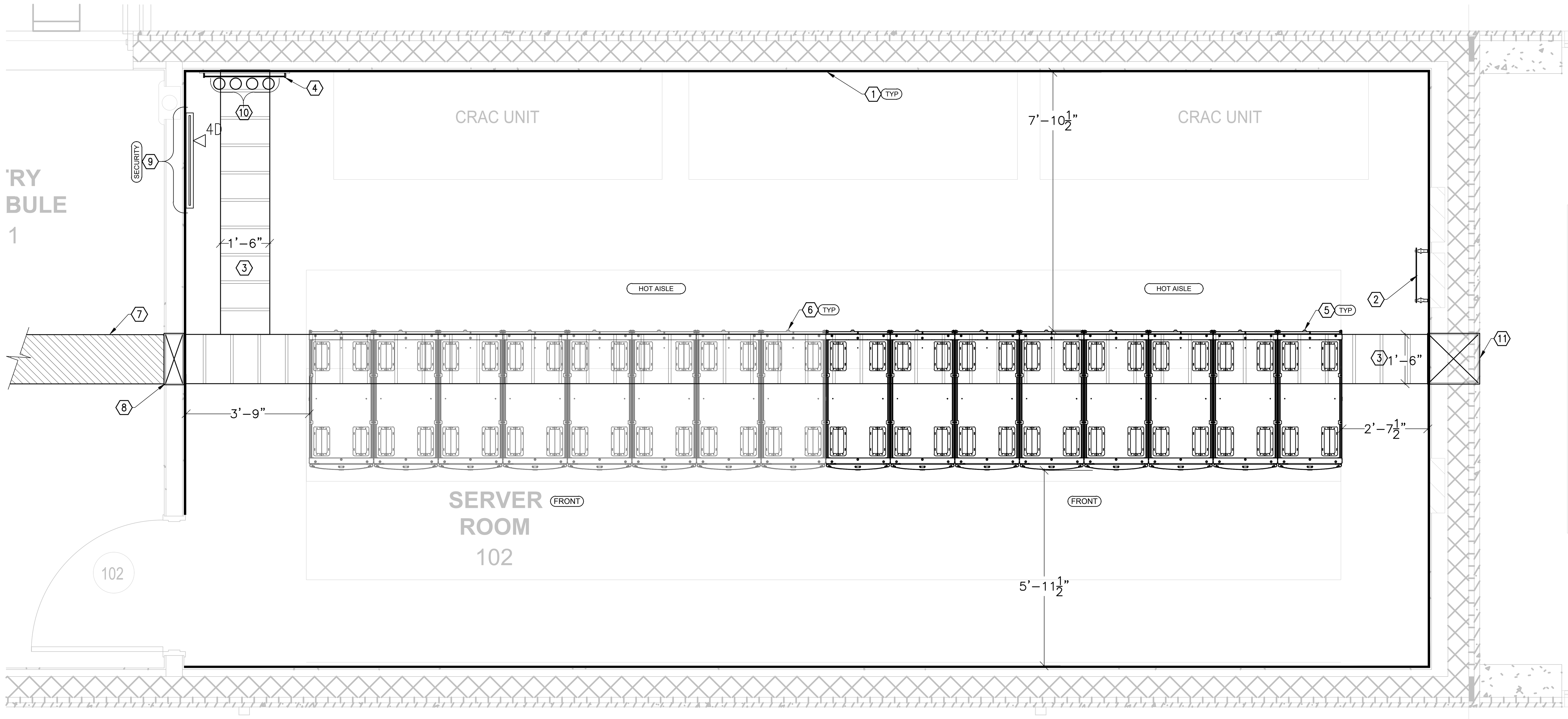

KEYED NOTES:

1. ¾" WALL MOUNTED PLYWOOD. (SEE NOTES PAGE)
2. PRIMARY BONDING BUSBAR (BY DIV 26)
3. HORIZONTAL CABLE RUNWAY/LADDER RACK. (AS INDICATED)
4. VERTICAL LADDER RACK. (AS INDICATED)
5. 600MM X 1200MM SERVER CABINET. (TYP)
6. 600MM X 1200MM SERVER CABINET FUTURE. (TYP)
7. CABLE TRAY IN VESTIBULE. (AS INDICATED) (BY DIV 26)
8. FRAME AND FINISH PENETRATION. FIRE STOP AS REQUIRED. (COORDINATE FIRE RATING)
9. RESERVED AREA (AS INDICATED)
10. OSP ENTRANCE COMMUNICATIONS CONDUITS. (AS INDICATED) (BY DIV 26)
11. FRAME AND FINISH AREA. INSTALL 1X3 WAVEGUIDE ENTRY PLATE FOR ANTENNA PASS-THROUGH.

SERVER ROOM DETAILS - COMMUNICATIONS

SCALE: 1/2" = 1'-0"

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Williamson County, Texas

Williamson County, Texas

1 NOT USED
Not to Scale

2 T568B CONNECTOR WIRING DETAIL
Not to Scale

GENERAL NOTES:

1.) ROTATE FACE PLATE 90° CLOCKWISE FOR HORIZONTAL CONFIGURATION.

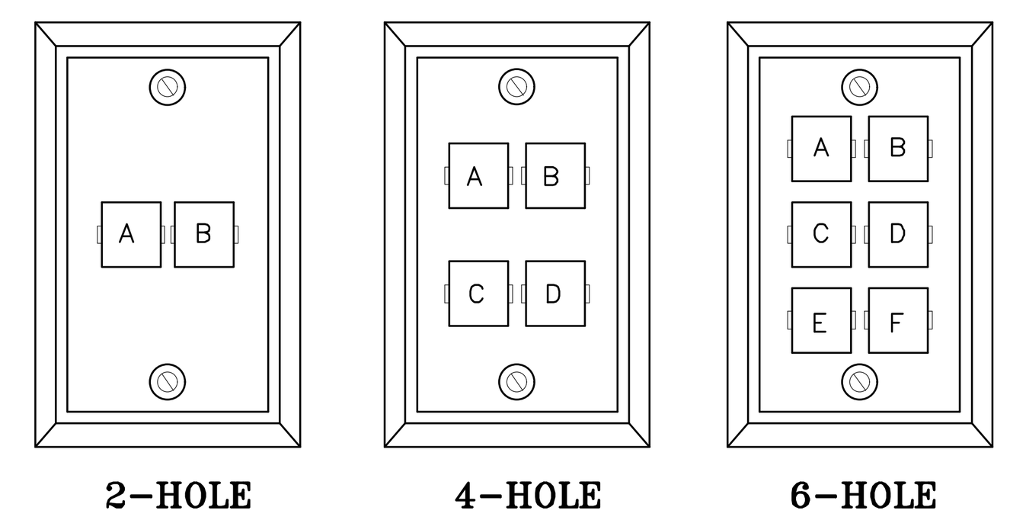
2.) PLASTIC FACE PLATE SHALL BE USED IN ALL SURFACE MOUNT, OVERHEAD, AND LAB TABLE RACEWAY OUTLETS. COORDINATE COLOR W/ARCHITECT.

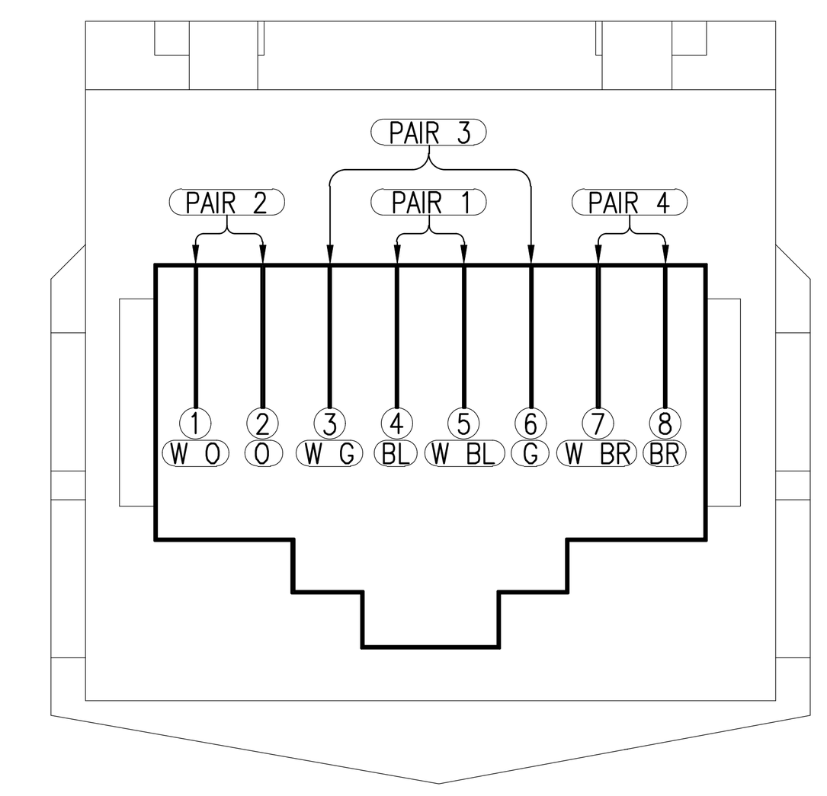
3.) FACE PLATE PLASTIC-COORDINATE COLOR W/OWNER

4.) ALL COMMUNICATIONS OUTLETS, TERMINATIONS BLOCKS AND PASSIVE CONNECTION DEVICES SHALL BE CONFIGURED TO TIA/EIA T568B WIRING STANDARDS.

CONNECTOR PIN ASSIGNMENTS

8 PIN MODULE JACK PIN No.	DATA CONNECTION COLOR CODE
1	WHITE/ORANGE
2	ORANGE
3	WHITE/GREEN
4	BLUE
5	WHITE/BLUE
6	GREEN
7	WHITE/BROWN
8	BROWN





JACK POSITIONS

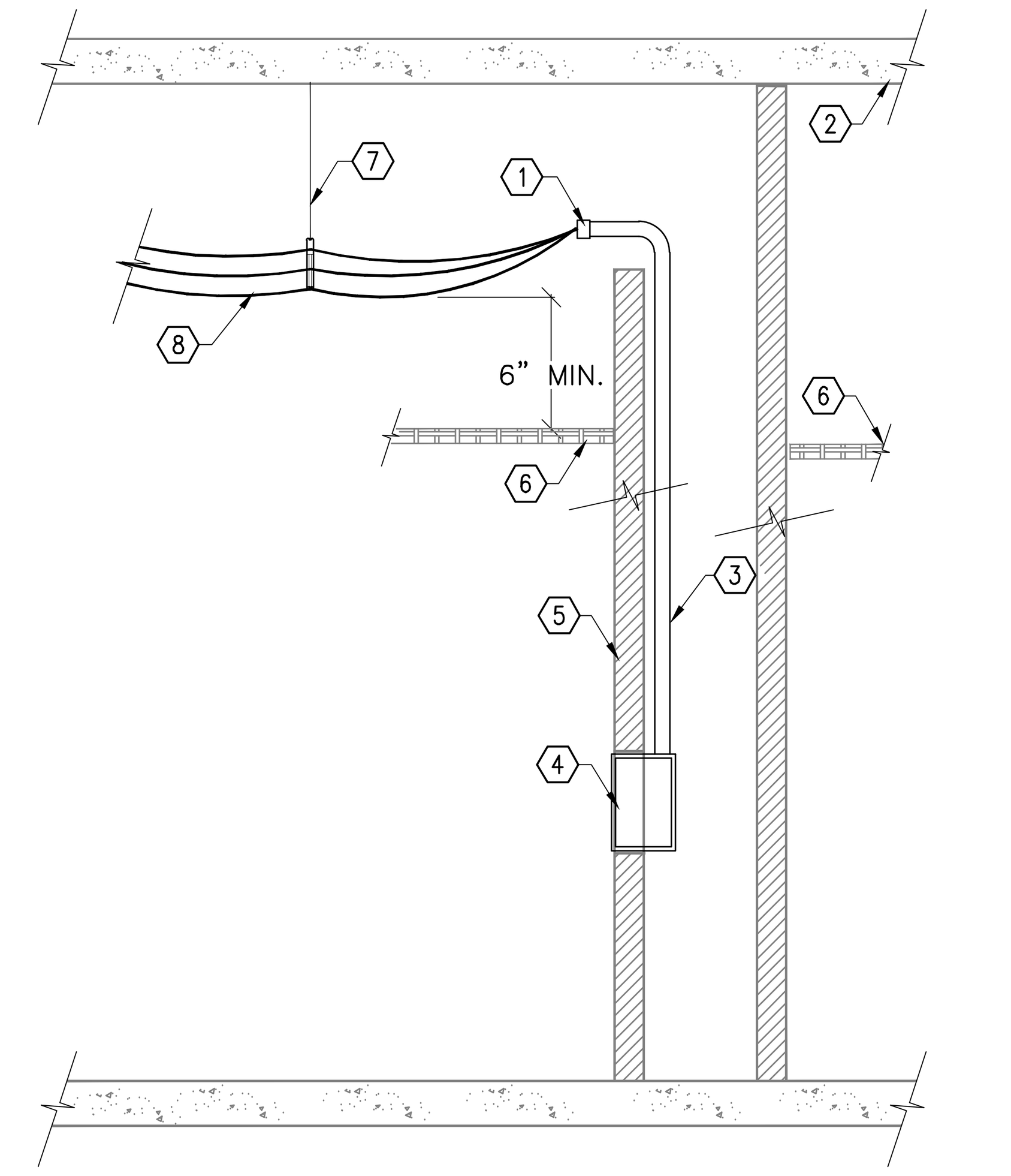
3 COMMUNICATIONS OUTLET DETAIL
Not to Scale

GENERAL NOTES:

1.) REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR LOCATION/AREAS WITH EXTENDED OR RAISED CEILINGS WHICH REQUIRE THIS CONDITION TO BE EMPLOYED.

KEYED NOTES:

1. INSULATED BUSHING.
2. DECK.
3. 1" (MIN.) EMPTY CONDUIT WITH PULL STRING.
4. BACK BOX AS INDICATED ON SYMBOL SCHEDULE. (TYP)
5. WALL
6. ACCESSIBLE CEILING.
7. J-HOOK CABLE SUPPORT.
8. COMMUNICATION CABLES.



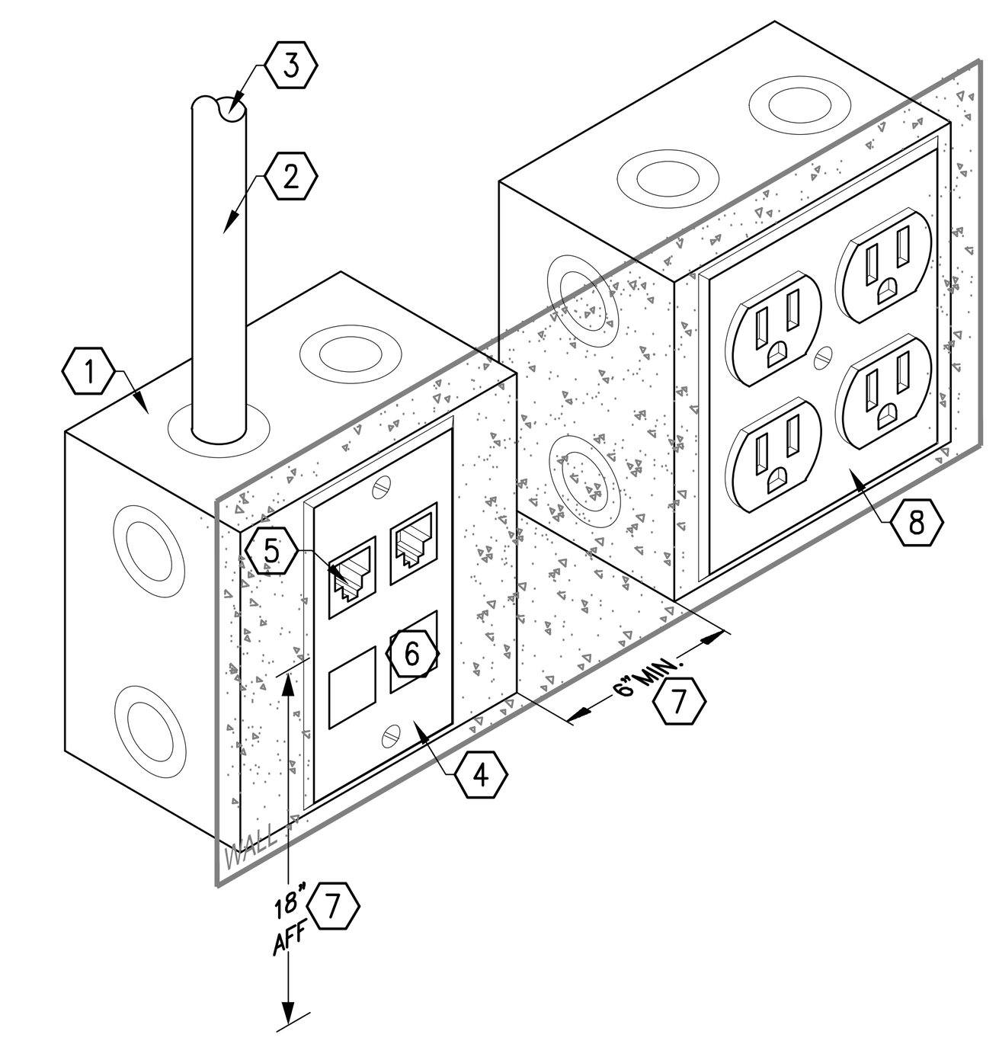
4 NOT USED
Not to Scale

5 NOT USED
Not to Scale

6 POWER AND DATA OUTLET DETAIL
Not to Scale

KEYED NOTES:

1. RECESSED DOUBLE GANG BOX (4 11/16"X4 11/16"X2 1/8") WITH SINGLE GANG REDUCTION PLATE. (BY DIV 26)
2. 1"ø CONDUIT WITH 200 LBS 1/4" POLYLINE PULL STRING. (BY DIV 26)
3. END OF CONDUIT DEBURRED AND FITTED WITH PROTECTIVE GROMMET. (BY DIV 26)
4. STRUCTURED CABLING, OUTLETS, COVER PLATES, AND JACKS SUPPLIED AND INSTALLED BY COMMUNICATION CONTRACTOR. COORDINATE COVERPLATES COLOR WITH ARCHITECT.
5. PROVIDE RJ-45 JACK FOR EACH CABLE.
6. FILL UNUSED POSITIONS WITH BLANKS.
7. COORDINATE EXACT MOUNTING HEIGHT AND DISTANCE WITH ARCHITECT/GC.
8. REFER TO ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR BOX, FACEPLATE, AND CONDUIT REQUIREMENTS.



7 NOT USED
Not to Scale

8 NOT USED
Not to Scale

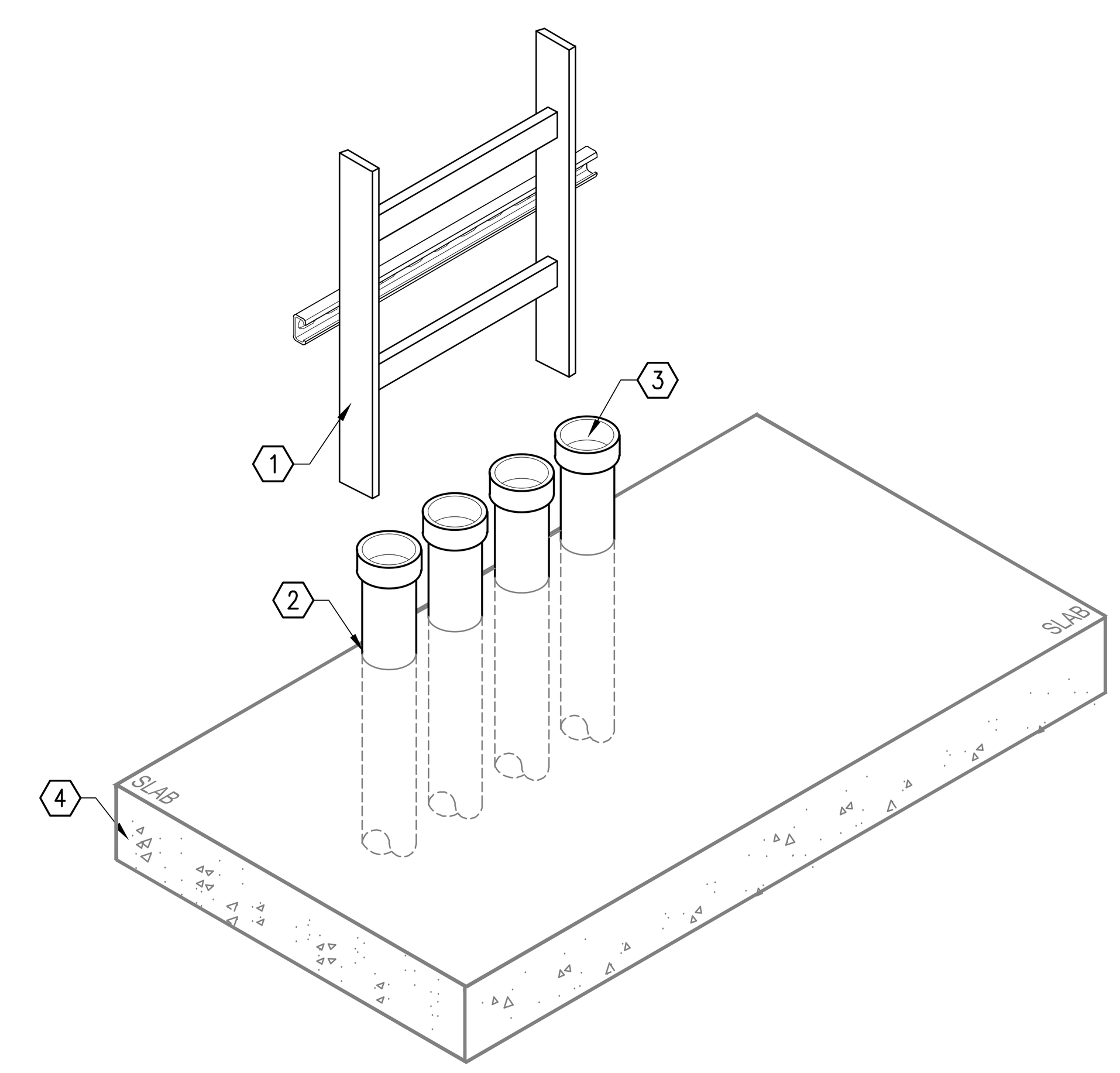
9 CONDUIT SLEEVE DETAIL
Not to Scale

GENERAL NOTE:

1.) REFER TO SPECIFICATIONS SECTION 270000 (FIRESTOPPING) FOR ADDITIONAL INFORMATION.

KEYED NOTES:

1. VERTICAL LADDER RACK AND UNISTRUT SUPPORT.
2. FIRE STOP SYSTEM THROUGH FIRE RATED PENETRATION.
3. COMMUNICATION SLEEVES TERMINATE 3" AFF.
4. 2-HOUR RATED FLOOR ASSEMBLY.



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PROJECT:
WILLIAMSON COUNTY - I.T. SERVER BLDG

SHEET CONTENTS:
GENERAL DETAILS - COMMUNICATIONS

DATE:
05/23/2019

JOB NO.:
18465.01

SHEET:
T9.01

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SECURITY NOTES

ARCHITECT/GEN. CONTRACTOR/CONST. MANAGER NOTES:

1.) THE ARCHITECT AND/OR GENERAL CONTRACTOR/CONSTRUCTION MANAGER IS RESPONSIBLE TO INSURE THAT ALL DIVISIONS AND TRADES ARE AWARE OF WORK REQUIRED TO SUPPORT THE INSTALLATION OF RELATED SYSTEMS AND SUB–SYSTEMS. CONTRACTORS ARE RESPONSIBLE TO REVIEW ALL RELATED SPECIFICATIONS AND DRAWINGS.

SECURITY NOTES:

1.) THE SECURITY INTEGRATOR (SUBCONTRACTOR) SHALL REVIEW ALL CONSTRUCTION DOCUMENTS FOR RELATED SECTIONS, WHICH MAKE UP THE CONTRACT DOCUMENTS AND SHALL COORDINATE ALL ELECTRONIC SECURITY WORK ON THE ELECTRONIC SECURITY PLANS WITH ANY ELECTRONIC SECURITY SECTIONS OF RELATED DRAWINGS AND SPECIFICATIONS.

A.) ELECTRONIC SECURITY REQUIREMENTS FOR THE PROJECT ARE THE RESPONSIBILITY OF THE SECURITY INTEGRATOR (SUBCONTRACTOR) UNLESS OTHERWISE NOTED. COORDINATE WITH ALL TRADES THAT APPLY. REFER TO MEP AND COMMUNICATIONS SHEETS FOR ADDITIONAL CABLING REQUIREMENTS.

2.) ALL COMPONENTS AND DEVICES SHOWN ON THESE DRAWINGS ARE FOR APPROXIMATE LOCATION AND POSITIONING ONLY. VERIFY EXACT LOCATIONS WITH THE OWNER OR G.C. PRIOR TO INSTALLATION.

3.) ALL PRIMARY SECURITY WIRING PATHWAYS OUTSIDE OF SECURITY ROOMS SHALL BE BY ELECTRICAL CONTRACTOR. ALL CONDUIT RUNS SHALL BE FROM THE INSTALLED SECURITY DEVICE LOCATION TO THE NEAREST ACCESSIBLE CEILING SPACE.

4.) CONTRACTOR SHALL COORDINATE WITH TELECOMMUNICATIONS CONTRACTOR AND CONSULT THE TELECOMMUNICATIONS DRAWINGS. INSTALL J–HOOKS AS REQUIRED TO SUPPORT SECURITY CABLING.

5.) PROVIDE ALL NECESSARY MEANS TO PROTECT ALL SECURITY CABLING AND CONNECTORS FROM MECHANICAL DAMAGE, DUST AND DIRT DURING CONSTRUCTION.

6.) FIRE PANEL CONNECTIVITY AND PROGRAMMING BY FIRE ALARM CONTRACTOR.

7.) SECURITY INTEGRATOR SHALL COORDINATE ANY INSTALLATION IN TELECOM ROOMS WITH OWNER IT DEPARTMENT.

8.) SHIELDED AND SCREENED CABLES SHALL HAVE THEIR SHIELD'S GROUNDED PER MANUFACTURER'S INSTRUCTION. WHEN SHIELD GROUNDS ARE REQUIRED AT ONE END ONLY, THEY SHALL BE GROUNDED AT THE DGP (MASTER PANEL WHEN REMOTE PANELS ARE USED), WITH THE OTHER END OF THE CABLE, INSULATED TO PREVENT SHIELD GROUNDING.

9.) ALL METALLIC DATA, SIGNALING AND POWER CONDUCTORS FOR ROOF, FENCE AND POLE/TOWER MOUNTED DEVICES/SENSORS SHALL HAVE SURGE SUPPRESSORS WITH MANUFACTURER RECOMMENDED GROUNDING AT BOTH THE DEVICE AND TERMINATION ENDS.

10.) ALL POWER SUPPLIES NOT FED FROM A UPS SHALL HAVE EXTERNAL SURGE SUPPRESSORS WITH MANUFACTURER RECOMMENDED GROUNDING.

ELECTRICAL CONTRACTOR NOTES:

1.) ELECTRICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE THE FOLLOWING FOR SECURITY INFRASTRUCTURE: CONDUIT, SLEEVES, WALL, AND FLOOR BOXES. REFER TO ELECTRICAL AND TELECOMMUNICATIONS DRAWINGS.

A.) PROVIDE AND INSTALL WALL MOUNTED ¾" FIRE RETARDANT PLYWOOD FOR ALL SECURITY PANEL LOCATIONS. APPLY WHITE OR LIGHT COLORED PAINT TO ALL SIDES OF PLYWOOD PRIOR TO INSTALLATION. (BY ELECTRICAL CONTRACTOR, OR AS DESIGNATED BY C.M.)

B.) REFER TO ARCHITECTURAL DRAWINGS TO COORDINATE WALL AND CABINETRY BOX LOCATIONS.

C.) ALL BOXES INSTALLED FOR SECURITY SHALL HAVE CONDUITS INSTALLED FROM BACK BOX TO NEAREST ACCESSIBLE CEILING SPACE AT A POINT THAT ALLOWS ADEQUATE VERTICAL WORK ROOM.

2.) CONTRACTOR SHALL PROVIDE RACEWAY INSTALLATION IN A MANNER THAT WILL PROTECT ALL SECURITY CABLING FROM MECHANICAL DAMAGE. INSTALL CONDUITS FOR SECURITY WITH LONG RADIUS BENDS AND BUSHED ENDS.

3.) PROVIDE DEDICATED RECEPTACLE CIRCUITS LOCATED ON OR NEAR EACH EQUIPMENT RACK LOCATED IN THE SECURITY ROOMS. SEE DRAWINGS FOR EXACT LOCATIONS.

4.) CONTRACTOR SHALL INSTALL A TIED OFF NYLON PULL STRING IN ALL CONDUITS.

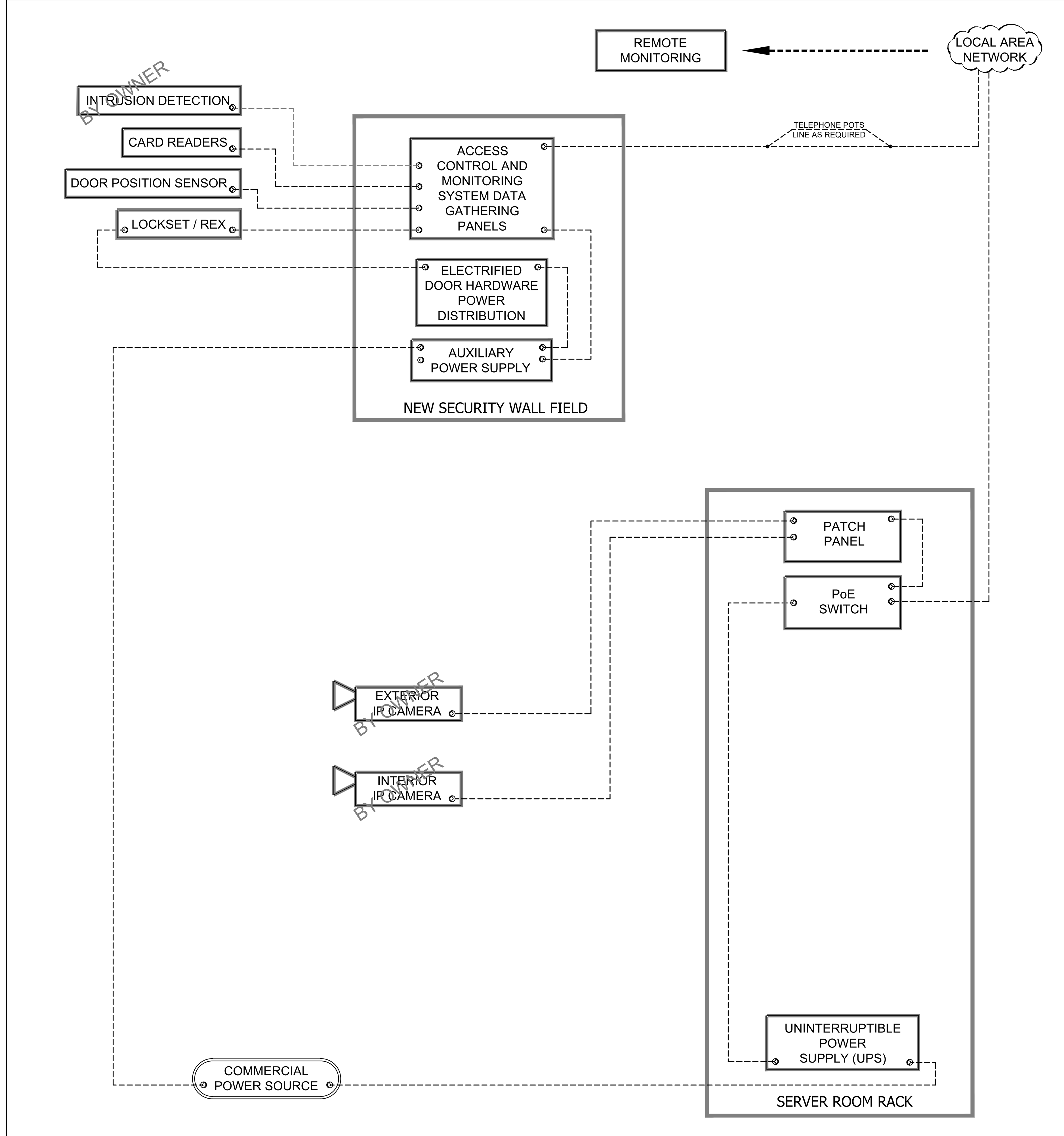
5.) IDENTIFICATION:

A.) SPRAY ALL BOXES AND CONDUIT FOR SECURITY WITH A DISTINCTIVE COLOR FOR EASY IDENTIFICATION. COLOR SHALL BE DIFFERENT FROM OTHER TRADES.

LEGEND

- HID R–40/15 iCLASS SE CARD READER.
- DOOR POSITION SENSOR.
- REQUEST TO EXIT. (REX) (BY DIV 08)
- DOOR/OPENING CALLOUT. REFER TO DESIGNATED DETAIL.
- OWNER FURNISHED, OWNER INSTALLED INTERIOR DOME CAMERA.
- OWNER FURNISHED, OWNER INSTALLED EXTERIOR DOME CAMERA.
- VIDEO INTERCOM. INTERCOM SHALL TIE TO EXISTING CISCO CALL MANAGER SYSTEM.

SECURITY BLOCK DIAGRAM



ABBREVIATIONS

AC:	ACCESS CONTROL
APS:	ACCESS CONTROL SYSTEM POWER SUPPLY
CCTV:	CLOSED CIRCUIT TELEVISION
CPS:	CAMERA POWER SUPPLY
CPU:	CENTRAL PROCESSING UNIT
CR:	CARD READER
DGP:	DATA GATHERING PANEL
DVR:	DIGITAL VIDEO RECORDER
DIV 01:	GENERAL REQUIREMENTS
DIV 08:	OPENINGS
DIV 26:	ELECTRICAL
DIV 27:	COMMUNICATIONS
DP:	DOOR POSITION SENSOR
FOV:	FIELD OF VIEW – CAMERA PICTURE
ID:	INTRUSION DETECTION
KVM:	KEYBOARD–VIDEO–MOUSE SWITCH
KP:	INTRUSION DETECTION KEYPAD
LPS:	LOCK POWER SUPPLY
MD:	MOTION DETECTOR
MP:	MEGAPIXEL – CAMERA RESOLUTION
NVR:	NETWORK VIDEO RECORDER
OFCI:	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI:	OWNER FURNISHED, OWNER INSTALLED
PoE:	POWER OVER ETHERNET
PP:	TELECOMMUNICATIONS PATCH PANEL
TR:	TELECOMMUNICATIONS ROOM
TCP/IP:	TRANSFER CONTROL/INTERNET PROTOCOL
UPS:	UNINTERRUPTIBLE POWER SUPPLY
UTP:	UNSHIELDED TWISTED PAIR
VMS:	VIDEO MANAGEMENT SYSTEM

DRAWING LIST

SC0.01	LEGEND AND NOTES – SECURITY
SC2.01	FLOOR PLAN – SECURITY
SC9.01	GENERAL DETAILS – SECURITY

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REG. NO. 191563R
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SHEET CONTENTS:
LEGEND AND NOTES - SECURITY

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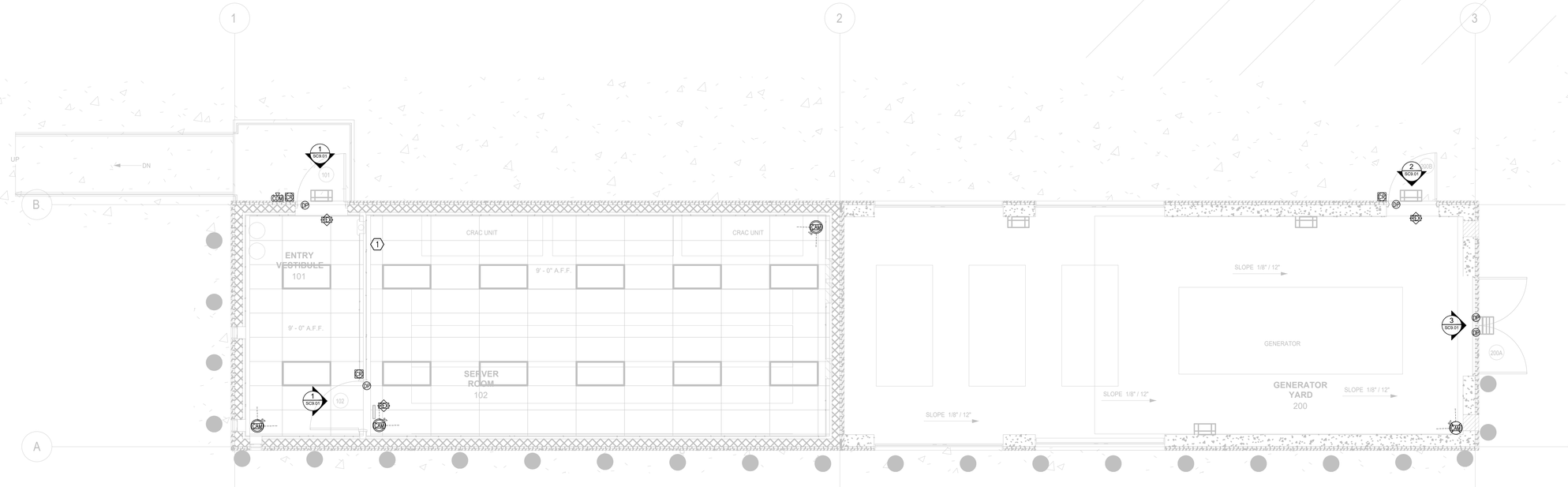

KEYED NOTES:

1. ROUTE ALL SECURITY DEVICES BACK TO NEW SECURITY PANELS IN DATA CENTER.

FLOOR PLAN - SECURITY

SCALE: 1/4" = 1'-0"

Williamson County, Texas

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Who: Fernando Trevino
When: 6/20/2019 12:48pm
Where:P:\Austin\WIlco - Server Room\Datacom-Server\SC2 (1).dwg
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SHEET CONTENTS:
FLOOR PLAN - SECURITY

DATE:
05/23/2019

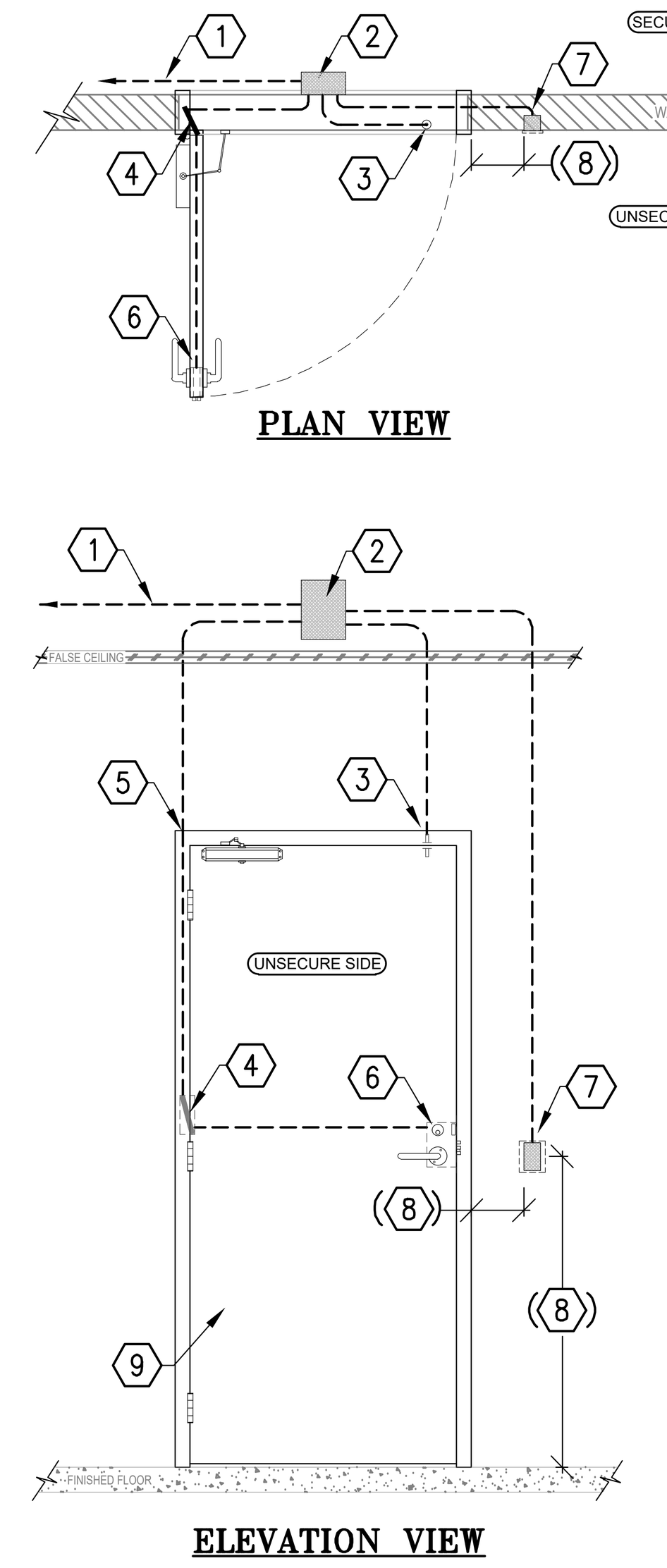
JOB NO:
18465.01

SHEET:
SC2.01

6/20/2019 1:29 PM

KEYED NOTES:

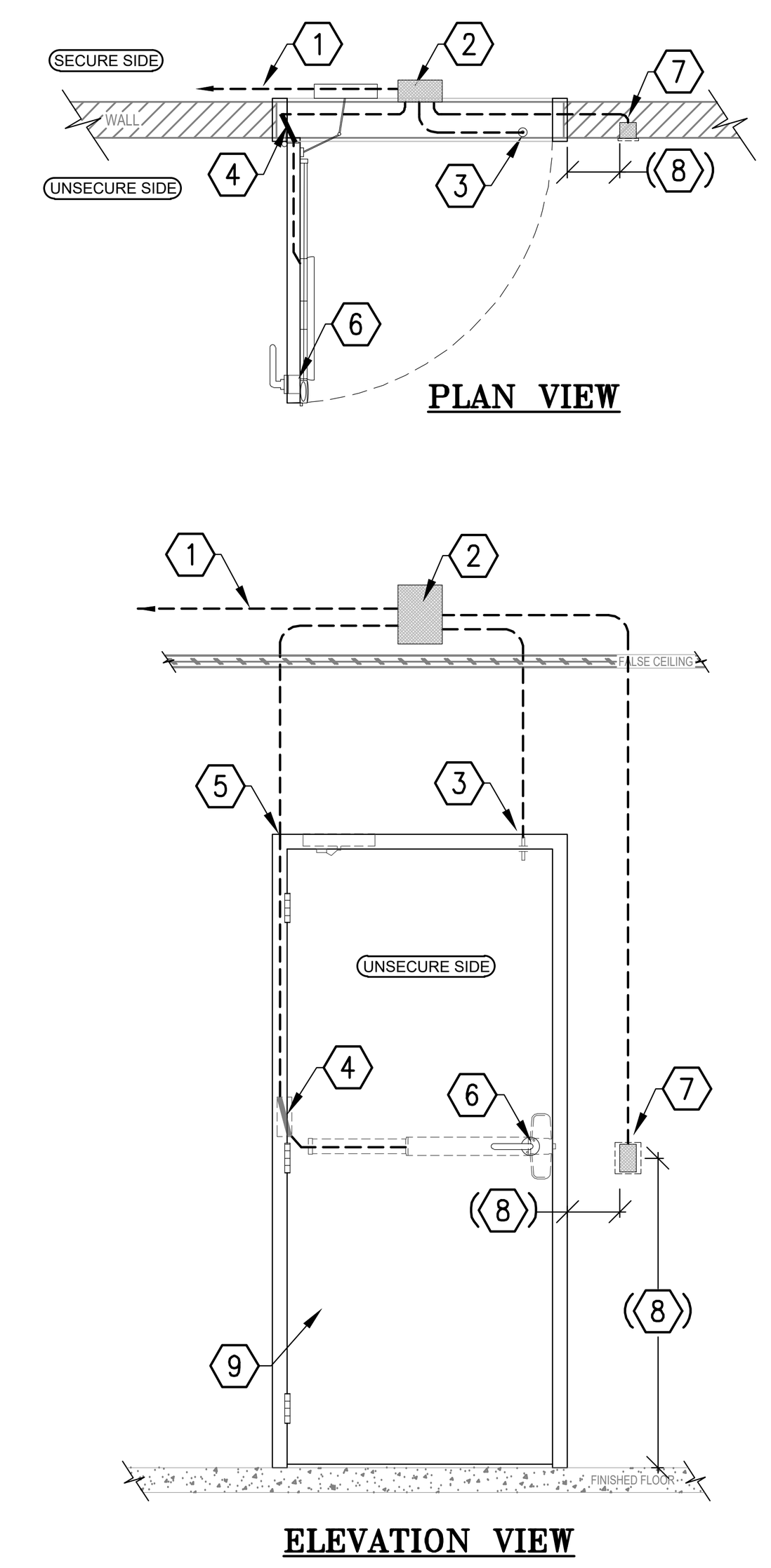
1. ¾"ø CONDUIT TO ACCESSIBLE CEILING FOR PATHWAY AND WIRING TO SECURITY CONTROL LOCATION. (BY DIV 26)
2. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
3. CONCEALED DOOR POSITION SENSOR. PROVIDE ¾"ø CONDUIT AND REQUIRED FRAME AND PATHWAY PREPARATION.
4. POWER TRANSFER FOR WIRE ROUTING TO J-BOX. (BY DIV 08)
5. PROVIDE ¾"ø CONDUIT, REQUIRED FRAME, AND PATHWAY PREPARATION FOR WIREWAY THROUGH DOOR.
6. ELECTRIFIED LOCKSET WITH INTEGRAL REX SWITCH. (BY DIV 08)
7. SINGLE GANG JUNCTION BOX AND ¾"ø CONDUIT FOR CARD READER. (BY DIV 26)
8. MOUNT CARD READER ON UNSECURE SIDE 42" AFF AND 6" OPTIMUM FROM DOOR.
9. COORDINATE WITH DIVISION 08 DOOR AND HARDWARE SPECIFICATIONS/DRAWINGS.



1 SINGLE ELEC. LOCK CARD READER DOOR
SCALE: Not to Scale

KEYED NOTES:

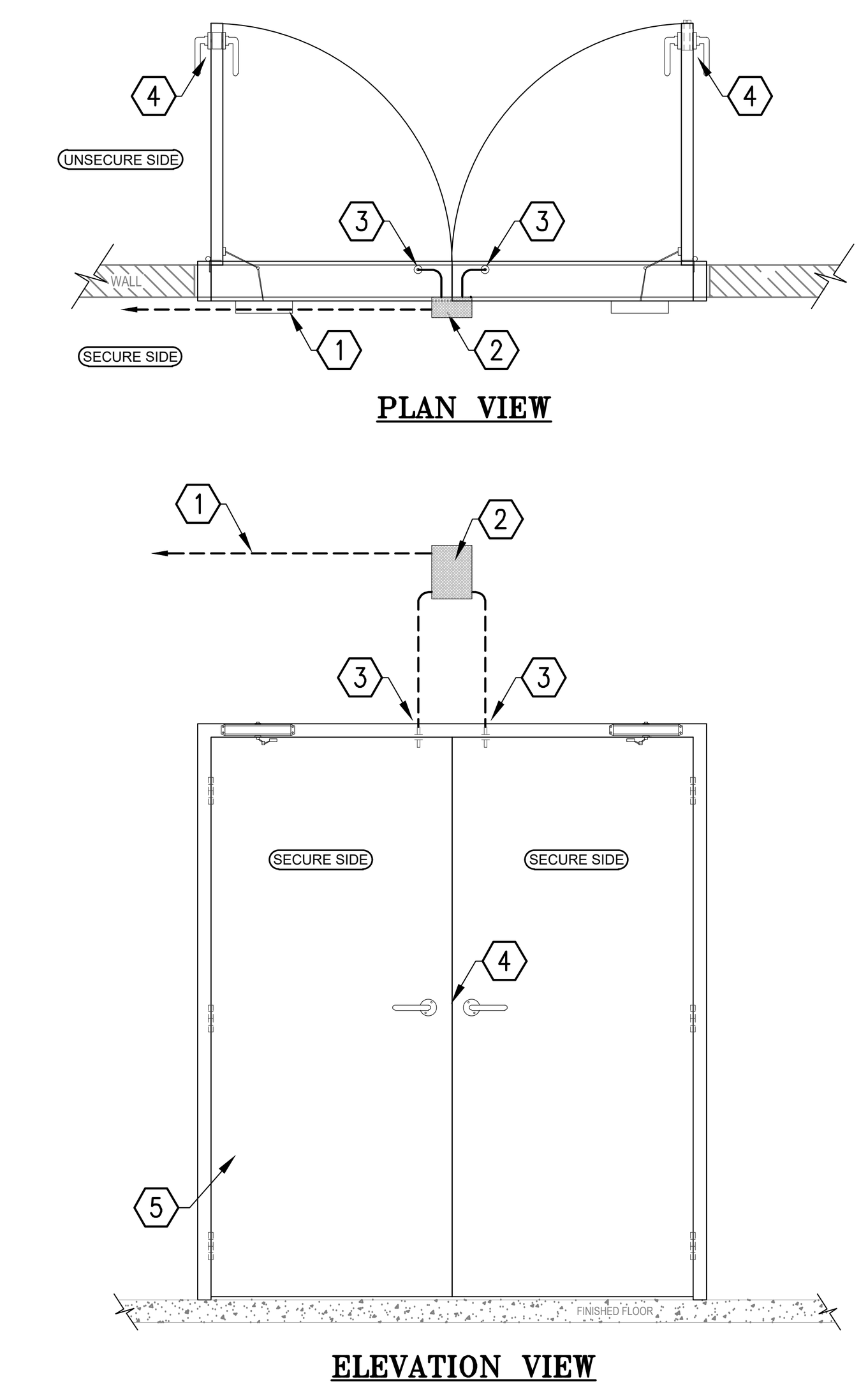
1. ¾"ø CONDUIT TO ACCESSIBLE CEILING FOR PATHWAY AND WIRING TO SECURITY CONTROL LOCATION. (BY DIV 26)
2. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
3. CONCEALED DOOR MONITOR SWITCH. PROVIDE ¾"ø CONDUIT AND REQUIRED FRAME AND PATHWAY PREPARATION.
4. POWER TRANSFER FOR WIRE ROUTING TO J-BOX. (BY DIV 08)
5. PROVIDE ¾"ø CONDUIT, REQUIRED FRAME, AND PATHWAY PREPARATION FOR WIREWAY THROUGH DOOR.
6. ELECTRIFIED EXIT DEVICE WITH INTEGRAL REX SWITCH ON SECURE SIDE. (BY DIV 08)
7. SINGLE GANG JUNCTION BOX AND ¾"ø CONDUIT FOR CARD READER. (BY DIV 26)
8. MOUNT CARD READER ON UNSECURE SIDE 42" AFF AND 6" OPTIMUM FROM DOOR.
9. COORDINATE WITH DIVISION 08 DOOR AND HARDWARE SPECIFICATIONS/DRAWINGS.



2 SINGLE EXIT DEVICE CARD READER DOOR
SCALE: Not to Scale

KEYED NOTES:

1. ¾"ø CONDUIT TO ACCESSIBLE CEILING FOR PATHWAY AND WIRING TO SECURITY CONTROL LOCATION. (BY DIV 26)
2. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
3. CONCEALED DOOR POSITION SENSOR. PROVIDE ¾"ø CONDUIT AND REQUIRED FRAME AND PATHWAY PREPARATION.
4. STANDARD LOCKSET. (BY DIV 08)
5. COORDINATE WITH DIVISION 08 DOOR AND HARDWARE SPECIFICATIONS/DRAWINGS.

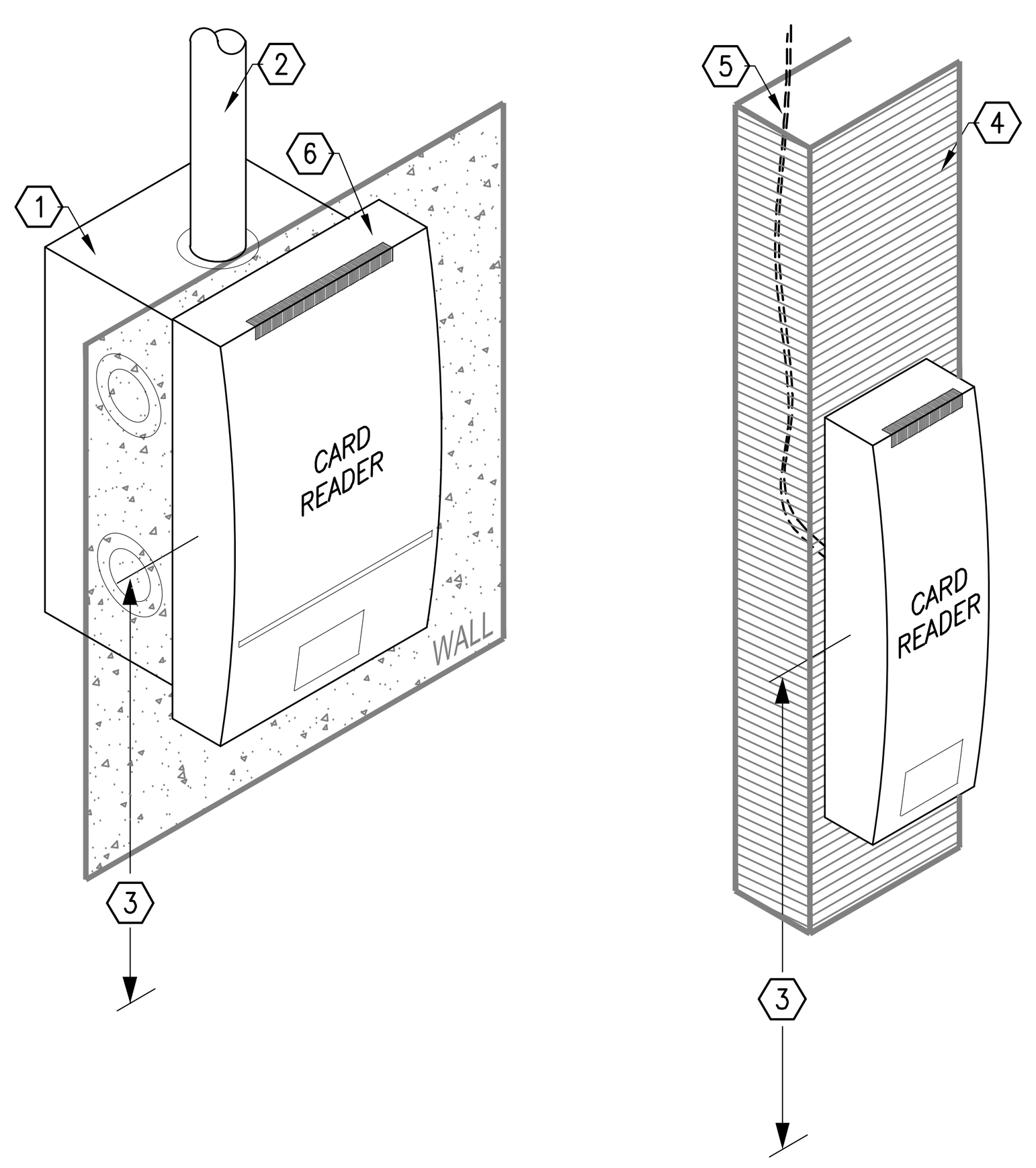


3 DOUBLE MONITORED DOOR
SCALE: Not to Scale

KEYED NOTES:

1. RECESSED SINGLE GANG BACK BOX.
2. ¾"ø CONDUIT C/W PULL STRING TO ACCESSIBLE CEILING SPACE. (BY DIV 26)
3. COORDINATE EXACT MOUNTING HEIGHT WITH ARCHITECT/GC.
4. DOOR MULLION.
5. COORDINATE WIRE ROUTING WITH DIV 08.

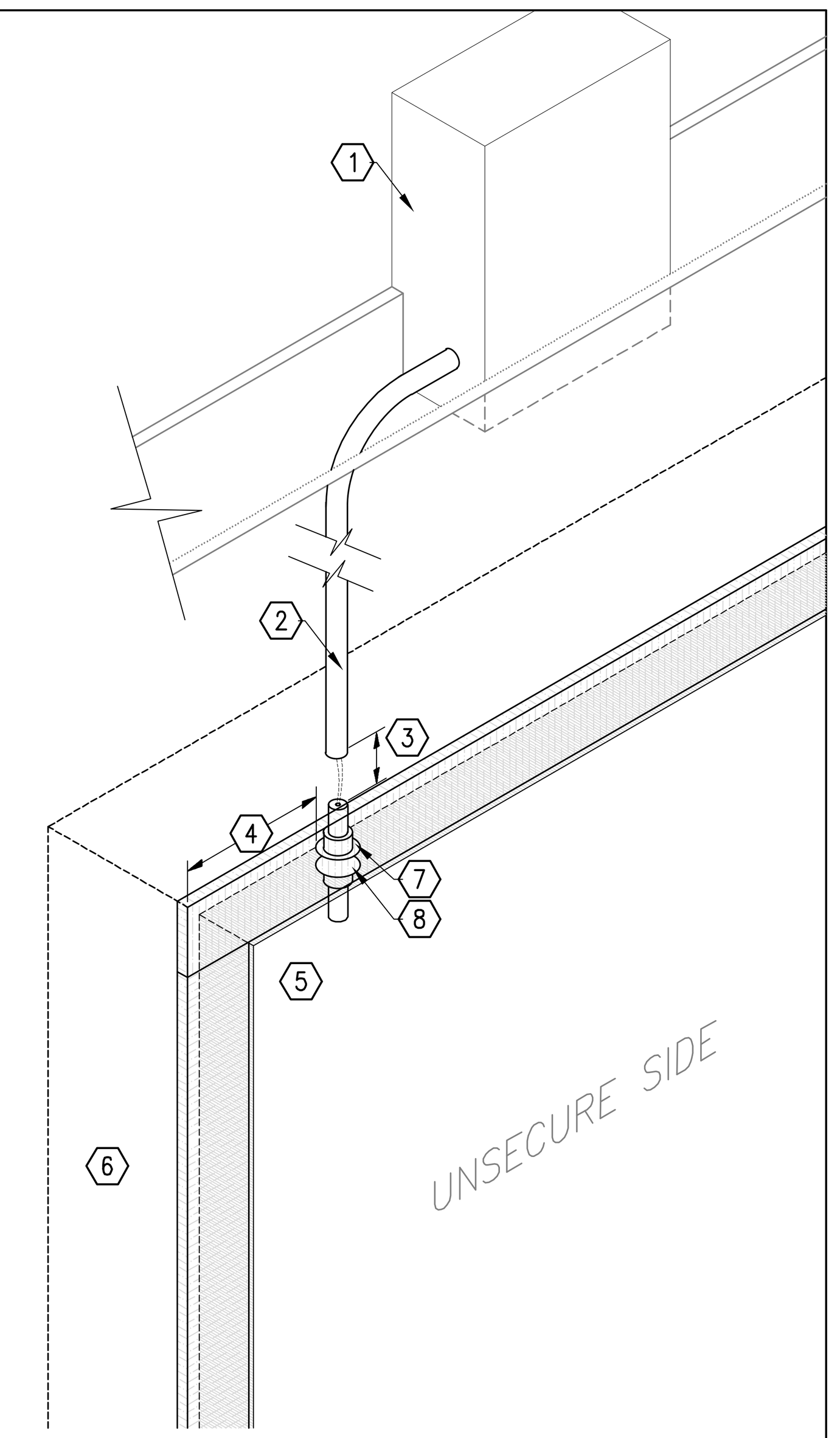
2 SINGLE EXIT DEVICE CARD READER DOOR
SCALE: Not to Scale



4 TYPICAL CARD READER DETAIL (Ⓡ)
SCALE: Not to Scale

KEYED NOTES:

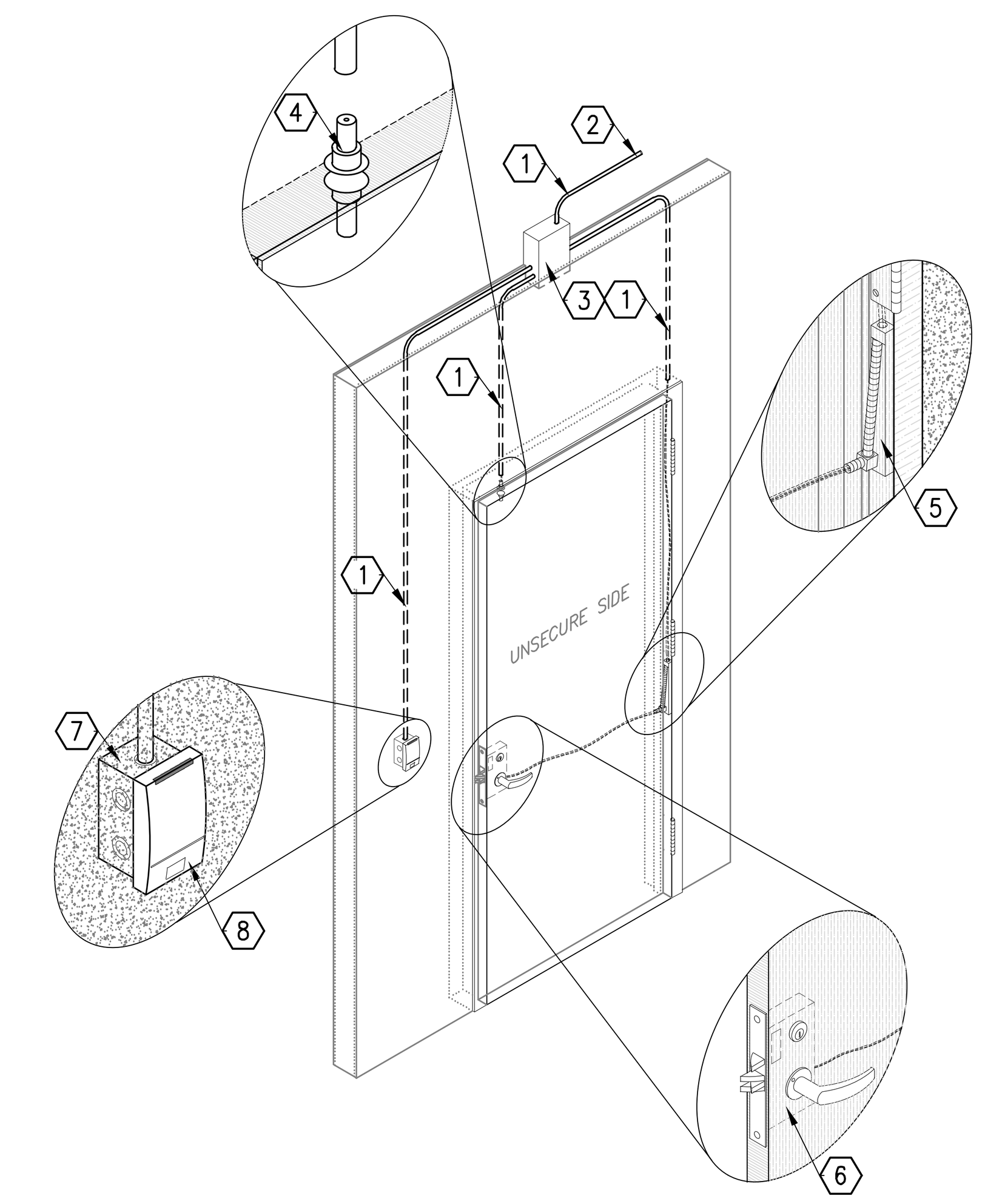
1. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
2. ¾"ø CONDUIT C/W PULL STRING. (BY DIV 26)
3. MAXIMUM OF 2" GAP WITH CLEAR WIRING PATH TO SWITCH.
4. 6" OPTIMAL FROM OUTSIDE EDGE OF HEADER.
5. DOOR. (BY DIV 08)
6. DOOR FRAME. (BY DIV 01 & 08)
7. DOOR POSITION SWITCH (1"ø) WITH DPDT CONTACTS.
8. DOOR MOUNTED MAGNET (1"ø).



5 MONITORED DOOR POSITION SENSOR (Ⓓ)
SCALE: Not to Scale

KEYED NOTES:

1. ¾"ø CONDUIT C/W POLYLINE PULL STRING.
2. TO SECURITY FIELD PANELS.
3. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX.
4. CONCEALED DOOR POSITION SENSOR.
5. POWER TRANSFER.
6. ELECTRIFIED LOCKSET WITH INTEGRAL REX SWITCH.
7. RECESSED SINGLE GANG BACK BOX.
8. CARD READER.



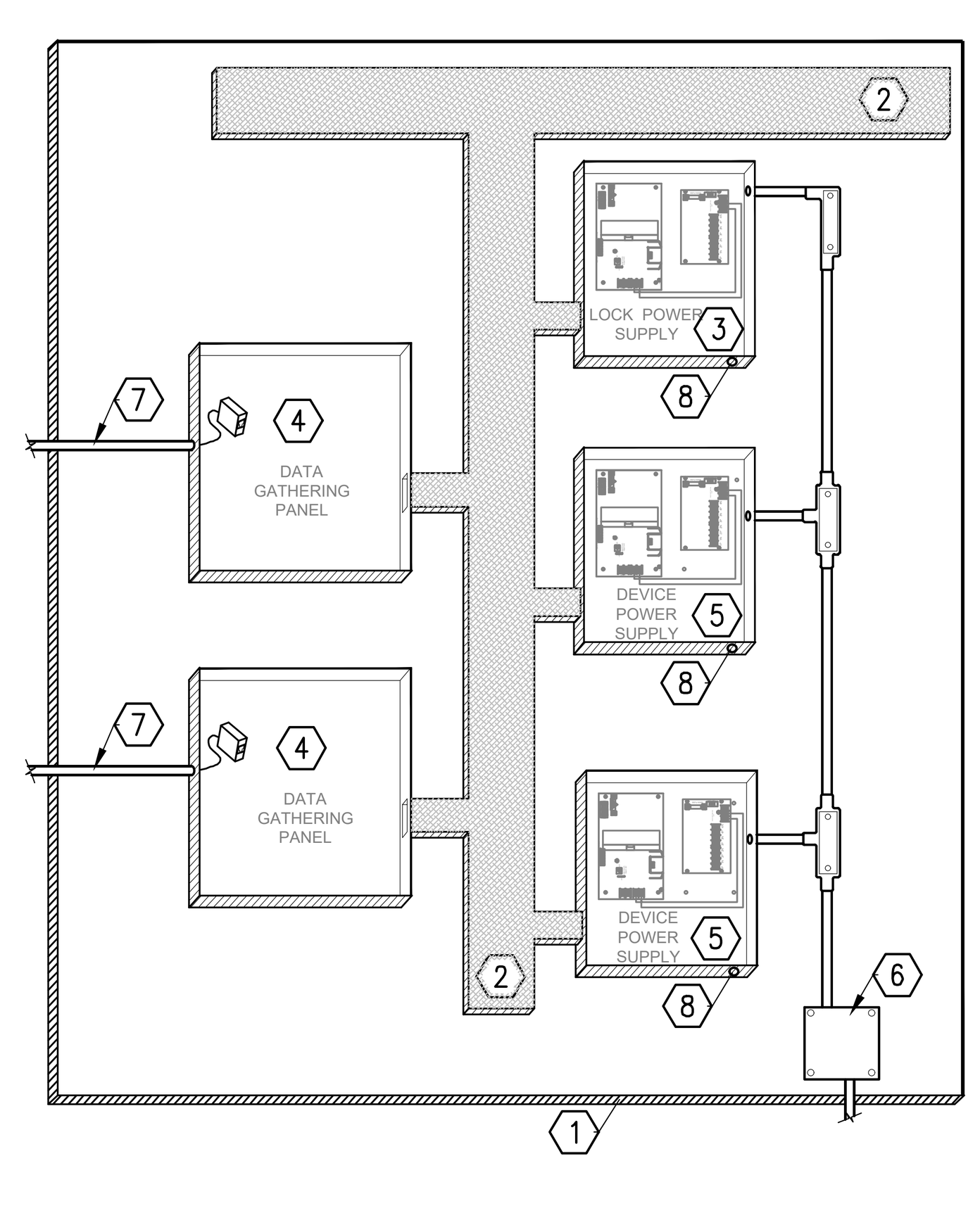
6 TYPICAL INTERIOR CARD READER DOOR
SCALE: Not to Scale

7 NOT USED - SECURITY
SCALE: Not to Scale

8 NOT USED - SECURITY
SCALE: Not to Scale

KEYED NOTES:

1. ¾" FIRE RETARDANT PLYWOOD PAINTED FLAT WHITE. (COORDINATED BY GENERAL CONTRACTOR)
2. WIREWAY. (AS REQUIRED)
3. LOCK POWER SUPPLY WITH TAMPER SWITCH.
4. SECURITY DEVICE DATA GATHERING PANELS (DGP) WITH TAMPER SWITCH.
5. SECURITY DEVICE POWER SUPPLY WITH TAMPER SWITCH.
6. EACH PANEL REQUIRES A DEDICATED 120VAC CIRCUIT WITH DEDICATED GROUND ON 24 HOUR EMERGENCY POWER. (BY DIV 26)
7. EACH DGP REQUIRES ONE VOICE AND ONE DATA CIRCUIT. (BY DIV 27)
8. FIRE ALARM INTERFACE.



9 TYPICAL SECURITY WALL FIELD (EXISTING)
SCALE: Not to Scale

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PROJECT MANUAL

Williamson County - Justice Center I.T. Server Building
Georgetown, Texas

May 23, 2019 **Construction Documents**

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KGA Architecture Project Number: **18465.01**

END OF DOCUMENT

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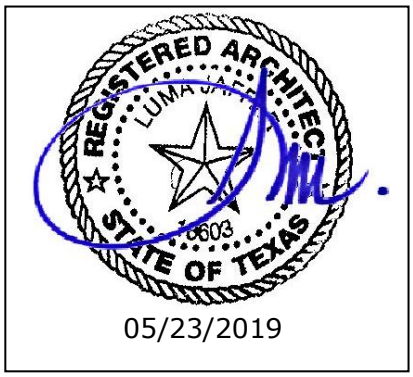


DIVISION 01 – GENERAL REQUIREMENTS
011000 Summary
011000 Alternates
012500 Substitution Procedures
012600 Contract Modification Procedures
012900 Payment Procedures
013100 Project Management and Coordination
013200 Construction Progress Documentation
013233 Photographic Documentation
013300 Submittal Procedures
014000 Quality Requirements
014200 References
015000 Temporary Facilities and Controls
016000 Product Requirements
017300 Execution
017700 Closeout Procedures
017823 Operation and Maintenance Data
017839 Project Record Documents
017900 Demonstration and Training

DIVISION 02 – EXISTING CONDITIONS
024113 Selective Site Demolition

DIVISION 03 – CONCRETE
033035 Under Slab Sheet Vapor Retarder

DIVISION 04 – MASONRY
042000 Unit Masonry

DIVISION 05 – METALS
055000 Metal Fabrications
055213 Pipe and Tube Railings

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES
061053 Miscellaneous Rough Carpentry

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
071326 Self-Adhering Sheet Waterproofing
072419 Water-Drainage Exterior Insulation and Finish System (EIFS)
075423 Thermoplastic-Polyolefin (TPO) Roofing
076200 Sheet Metal Flashing and Trim
076210 Flexible Flashing
077100 Roof Specialties
077200 Roof Accessories
079200 Joint Sealants

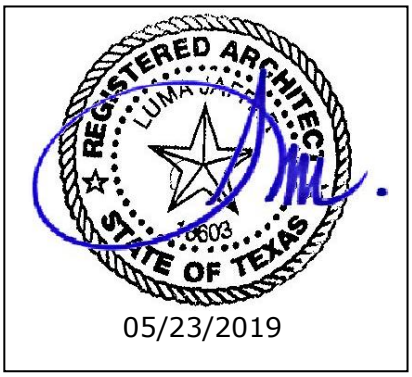
KGA 18459.01

DIVISION 08 – OPENINGS
081113 Hollow Metal Doors and Frames
081169 Metal Storm Doors and Frames
087100 Door Hardware

DIVISION 09 – FINISHES
092216 Non-Structural Metal Framing
092900 Gypsum Board
095113 Acoustical Panel Ceilings
096900 Access Flooring
099113 Exterior Painting
099123 Interior Painting

DIVISION 10 – SPECIALTIES
104413 Fire Protection Cabinets
104416 Fire Extinguishers

DIVISION 31 – EARTHWORK
313116 Termite Control



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SEAL

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DIVISION 31 – EARTHWORK
310005 Civil and Site Work

END OF DOCUMENT

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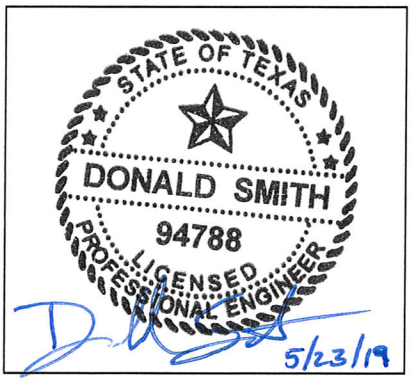


DIVISION 21 – FIRE SUPPRESSION

210500 Common Work Results for Fire Suppression
212200 Clean-Agent Fire-Extinguishing Systems

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

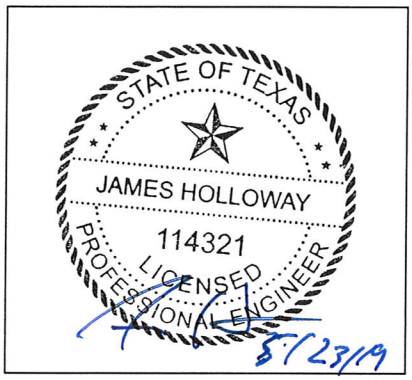
230500 Common Work Results for HVAC
230513 Common Motor Requirements for HVAC Equipment
230529 Hangers & Supports for HVAC Piping & Equipment
230553 Identification for HVAC Piping & Equipment
230593 Testing, Adjusting and Balancing for HVAC Systems
230719 HVAC Piping Insulation
230900 Facility Management System
232300 Refrigerant Piping
233300 Air Duct Accessories
233713 Diffusers, Registers, and Grilles
238123 Computer-Room Air-Conditioners, Floor-Mounted Units

18465.01

The specification sections listed below were prepared by or under the direct supervision of the Electrical Engineer:

Agnew Associates, Inc. (TBPE Firm #1005)
14205 Burnet Rd., Suite 200
Austin, TX 78660

SEAL



DIVISION 26 – ELECTRICAL

260500	Common Work Results for Electrical
260519	Low Voltage Electrical Power Conductors & Cables
260529	Hangers & Supports for Electrical Systems
260533	Raceway & Boxes for Electrical Systems
260543	Underground Electrical Duct
260553	Electrical Identification
260913	Emergency/Standby Power Systems – Diesel Generator
262200	Low-Voltage Transformers
262416	Panelboards
262726	Wiring Devices
263600	Transfer Switches
264113	Lightning Protection for Structures
265119	LED Interior Lighting
265219	Emergency and Exit Lighting
265613	Lighting Poles and Standards
265619	LED Exterior Lighting

END OF DOCUMENT

KGA 18459.01

DOCUMENT 00 01 07

PROFESSIONAL SEALS PAGE

The specification sections listed below were prepared by or under the direct supervision of the Low Voltage Engineer:

DataCom Design Group LLC.
7600 Burnet Road
Suite 350
Austin, Texas 78757

SEAL

DIVISION 27 – Communications
270000 Communications
270526 Grounding and Bonding
270543 Underground Ducts & Raceways
271100 Communications Room Fittings
271300 Backbone Cabling
271500 Horizontal Cabling

DIVISION 28 – Security
280000 Electronic Security
281000 Access Control and Intrusion Detection
282600 Emergency Intercom and Duress

END OF DOCUMENT

KGA 18465.01

DOCUMENT 00 01 07

PROFESSIONAL SEALS PAGE

The specification sections listed below were prepared by or under the direct supervision of the Low Voltage Engineer:

DataCom Design Group LLC.
7600 Burnet Road
Suite 350
Austin, Texas 78757

SEAL

DIVISION 27 – Communications

270000 Communications
270526 Grounding and Bonding
270543 Underground Ducts & Raceways
271100 Communications Room Fittings
271300 Backbone Cabling
271500 Horizontal Cabling

DIVISION 28 – Security

280000 Electronic Security
281000 Access Control and Intrusion Detection
282600 Emergency Intercom and Duress

END OF DOCUMENT

DOCUMENT 00 01 10

TABLE OF CONTENTS

INDEX OF ISSUES

END OF TABLE OF CONTENTS

SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Owner-furnished products.
5. Access to site.
6. Work restrictions.
7. Specification and Drawing conventions.

1.2 PROJECT INFORMATION

A. Project Identification: Williamson County – Justice Center I.T. Server Building.
1. Project Location: 405 Martin Luther King Drive, Georgetown, Texas 78626.

B. Owner: Williamson County, 405 Martin Luther King Drive, Georgetown, Texas 78626.

C. Architect: KGA Architecture, 512-441-8200.

D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. Refer to Title Page.

E. Web-Based Project Software: Project software administered by Architect will be used for purposes of managing communication and documents during the construction stage.
1. See Section 01 31 00 "Project Management and Coordination." for requirements for using web-based Project software.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
1. New construction of a one-story concrete masonry unit I.T. Vault and other Work indicated in the Contract Documents.

B. Type of Contract:
1. Project will be constructed under a single prime contract.

1.4 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.5 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated.
   1. Weekend Hours: Coordinate with Owner.
   2. Early Morning Hours: Coordinate with Owner.
   3. Hours for Utility Shutdowns: Coordinate with Owner.

C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.

D. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

E. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Structural Hardening for EF3 Storm Rating.
   1. Replacement of standard structural systems with hardened structural systems to achieve an EF3 storm rating as indicated on Structural Drawings. Hardened structural systems include exterior walls, yard walls, and roof assemblies. This alternate also includes the addition of a removable grate over the mechanical yard. As part of this alternate, standard exterior doors and louvers are also to be replaced with storm rated doors and louvers as indicated on schedules and in specifications.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit a digital copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use facsimile of form provided in Project Manual.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. Certificates and qualification data, where applicable or requested.
      g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
      h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
      i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
      j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided

within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.

g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
      b. Requested substitution does not require extensive revisions to the Contract Documents.
      c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      d. Substitution request is fully documented and properly submitted.
      e. Requested substitution will not adversely affect Contractor's construction schedule.
      f. Requested substitution has received necessary approvals of authorities having jurisdiction.
      g. Requested substitution is compatible with other portions of the Work.
      h. Requested substitution has been coordinated with other portions of the Work.
      i. Requested substitution provides specified warranty.
      j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 25 00.13

SUBSTITUTION REQUEST FORM

PROJECT: _____ **(After Contract Award)**

TO: _____
_____

NO. _____ DATE: _____

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section "Substitution Procedures:"

1. SPECIFIED PRODUCT OR SYSTEM

Substitution request for: _____

Specification Section No.: _____Article/ Paragraph: _____

2. REASON FOR SUBSTITUTION REQUEST

SPECIFIED PRODUCT . . .

- ☐ Is no longer available.
- ☐ Is unable to meet project schedule.
- ☐ Is unsuitable for the designated application.
- ☐ Cannot interface with adjacent materials.
- ☐ Is not compatible with adjacent materials.
- ☐ Cannot provide the specified warranty.
- ☐ Cannot be constructed as indicated
- ☐ Cannot be obtained due to one or more of the following:
  - ☐ Strike
  - ☐ Lockout
  - ☐ Bankruptcy of manufacturer or supplier
  - ☐ Similar occurrence (explain below)

PROPOSED PRODUCT . . .

- ☐ Will reduce construction time
- ☐ Will result in cost savings of $ _____ to Project
- ☐ Is for supplier's convenience
- ☐ Is for subcontractor's convenience
- ☐ Other:_____
  _____

3. SUPPORTING DATA

- ☐ Drawings, specifications, product data, performance data, test data, and any other necessary information to facilitate review of the Substitution Request are attached.
- ☐ Sample is attached.
- ☐ Sample will be sent if requested.

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4. QUALITY COMPARISON

Provide all necessary side-by-side comparative data as required to facilitate review of Substitution Request:

	SPECIFIED PRODUCT	PROPOSED PRODUCT
Manufacturer:	_____	_____
Name / Brand:	_____	_____
Catalog No.:	_____	_____
Vendor:	_____	_____
Variations:	_____	_____

(Add Additional Sheets If Necessary)

Local Distributor or Supplier: _____

Maintenance Service Available: ☐ Yes ☐ No

Spare Parts Source: _____

Warranty: ☐ Yes ☐ No _____ Years

5. PREVIOUS INSTALLATIONS

Identification of at least three similar projects on which proposed substitution was used:

PROJECT #1:

Project: _____

Address: _____

_____

Architect: _____

Owner: _____

Contractor: _____

Date Installed: _____

PROJECT #2:

Project: _____

Address: _____

_____

Architect: _____

Owner: _____

Contractor: _____

Date Installed: _____

PROJECT #3:

Project: _____

Address: _____

_____

Architect: _____

Owner: _____

Contractor: _____

Date Installed: _____

6. EFFECT OF SUBSTITUTION

Proposed substitution affects other work or trades: ☐ No ☐ Yes (if Yes, explain)

_____

_____

Proposed substitution requires dimensional revisions or redesign of architectural, structural, M-E-P, life safety, or other work:

☐ No ☐ Yes (if Yes, attach data explaining revisions)

7. STATEMENT OF CONFORMANCE OF REQUEST TO CONTRACT REQUIREMENTS

Contractor and Subcontractor have investigated the proposed substitution and hereby represent that:

A. They have personally investigated the proposed substitution and believe that it is equal to or superior in all respects to specified product, except as stated above;

B. The proposed substitution is in compliance with applicable codes and ordinances;

C. The proposed substitution will provide same warranty as specified for specified product;

D. They will coordinate the incorporation of the proposed substitution into the Work, and will include modifications to the Work as required to fully integrate the substitution;

E. They have included complete cost data and implications of the substitution (attached);

F. They will pay any redesign fees incurred by the Architect or any of the Architect's consultants, and any special inspection costs incurred by the Owner, caused by the use of this product;

G. They waive all future claims for added cost or time to the Contract related to the substitution, or that become known after substitution is accepted.

H. The Architect's approval, if granted, will be based upon reliance upon data submitted and the opinion, knowledge, information, and belief of the Architect at the time decision is rendered and Addendum is issued; and that Architect's approval therefore is interim in nature and subject to reevaluation and reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed.

Contractor:_____
(Name of Contractor)

Date: _____ By: _____

Subcontractor:_____
(Name of Subcontractor)

Date: _____ By: _____

Note: Unresponsive or incomplete requests will be rejected and returned without review.

8. ARCHITECT'S REVIEW AND ACTION

☐ Substitution is accepted.

☐ Substitution is accepted, with the following comments:_____

_____

_____

☐ Resubmit Substitution Request:

☐ Provide more information in the following areas: _____

_____

_____

☐ Provide proposal indicating amount of savings / credit to Owner

☐ Bidding Contractor shall sign Bidder's Statement of Conformance

☐ Bidding Subcontractor shall sign Bidder's Statement of Conformance

☐ Substitution is not accepted:

☐ Substitution Request received too late.

☐ Substitution Request received directly from subcontractor or supplier.

☐ Substitution Request not submitted in accordance with requirements.

☐ Substitution Request Form is not properly executed.

☐ Substitution Request does not indicate what item is being proposed.

☐ Insufficient information submitted to facilitate proper evaluation.

☐ Proposed product does not appear to comply with specified requirements.

☐ Proposed product will require substantial revisions to Contract Documents.

By: _____

Date:_____

Architect has relied upon the information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to be not in compliance with the Contract Documents, Contractor shall provide the specified product.

9. OWNER'S REVIEW AND ACTION

☐ Substitution is accepted; Architect to prepare Change Order.

☐ Substitution is not accepted.

☐ Owner will pay Architect directly for redesign fees.

☐ Include Architect's Additional Service fee for implementing the substitution in the Change Order.

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By: _____
(Owner/Owner's Representative)

Date:_____

END OF FORM

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include costs of labor and supervision directly attributable to the change.
   5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's Project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
   4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
      a. Differentiate between items stored on-site and items stored off-site.
   5. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
   6. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
   7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706.
5. AIA Document G706A.
6. Evidence that claims have been settled.
7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. RFIs.
   4. Digital project management procedures.
   5. Project meetings.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, in web-based Project software directory, and in prominent location inbuilt facility. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
e. Indicate required installation sequences.
f. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.

4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
    a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
4. The following digital data files will be furnished for each appropriate discipline:
    a. Floor plans.
    b. Reflected ceiling plans.

B. Web-Based Project Software: Use Architect's web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.
    a. Oracle Contract Manager – Primavera.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare 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.
2. Name file with submittal number or other unique identifier, including revision identifier.

3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15days after execution of the Agreement.
   1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Responsibilities and personnel assignments.
      b. Tentative construction schedule.
      c. Critical work sequencing and long lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Use of web-based Project software.
      g. Procedures for processing field decisions and Change Orders.
      h. Procedures for RFIs.
      i. Procedures for testing and inspecting.
      j. Procedures for processing Applications for Payment.
      k. Distribution of the Contract Documents.
      l. Submittal procedures.
      m. Preparation of Record Documents.
      n. Use of the premises.
      o. Work restrictions.
      p. Working hours.
      q. Owner's occupancy requirements.
      r. Responsibility for temporary facilities and controls.
      s. Procedures for moisture and mold control.
      t. Procedures for disruptions and shutdowns.
      u. Construction waste management and recycling.
      v. Parking availability.
      w. Office, work, and storage areas.
      x. Equipment deliveries and priorities.
      y. First aid.
      z. Security.
      aa. Progress cleaning.
   3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
      a. Contract Documents.
      b. Options.
      c. Related RFIs.
      d. Related Change Orders.
      e. Purchases.
      f. Deliveries.
      g. Submittals.
      h. Review of mockups.
      i. Possible conflicts.
      j. Compatibility requirements.
      k. Time schedules.
      l. Weather limitations.
      m. Manufacturer's written instructions.
      n. Warranty requirements.
      o. Compatibility of materials.
      p. Acceptability of substrates.
      q. Temporary facilities and controls.
      r. Space and access limitations.
      s. Regulations of authorities having jurisdiction.
      t. Testing and inspecting requirements.
      u. Installation procedures.
      v. Coordination with other work.
      w. Required performance results.
      x. Protection of adjacent work.
      y. Protection of construction and personnel.
   3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
   4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
   5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
   1. Conduct the conference to review requirements and responsibilities related to Project closeout.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
      a. Preparation of Record Documents.

b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Submittal of written warranties.
e. Requirements for completing sustainable design documentation.
f. Requirements for preparing operations and maintenance data.
g. Requirements for delivery of material samples, attic stock, and spare parts.
h. Requirements for demonstration and training.
i. Preparation of Contractor's punch list.
j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
k. Submittal procedures.
l. Owner's partial occupancy requirements.
m. Installation of Owner's furniture, fixtures, and equipment.
n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of Proposal Requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.

19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Construction Schedule.
   2. Daily construction reports.
   3. Material location reports.
   4. Site condition reports.
   5. Unusual event reports.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. Event: The starting or ending point of an activity.

D. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at weekly intervals.

E. Material Location Reports: Submit at monthly intervals.

F. Site Condition Reports: Submit at time of discovery of differing conditions.

G. Unusual Event Reports: Submit at time of unusual event.

H. Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages and interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
   4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
   5. Commissioning Time: Include no fewer than 15 days for commissioning.
   6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   3. Work Restrictions: Show the effect of the following items on the schedule:
      a. Seasonal variations.
      b. Environmental control.
   4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
      a. Subcontract awards.
      b. Submittals.
      c. Purchases.
      d. Mockups.
      e. Fabrication.
      f. Sample testing.
      g. Deliveries.
      h. Installation.
      i. Tests and inspections.
      j. Adjusting.
      k. Curing.
      l. Startup and placement into final use and operation.
      m. Commissioning.
   5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
      a. Structural completion.
      b. Temporary enclosure and space conditioning.
      c. Permanent space enclosure.
      d. Completion of mechanical installation.
      e. Completion of electrical installation.
      f. Substantial Completion.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
   1. Temporary enclosure and space conditioning.
   2. .

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
   1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.
   4. Notations on returned submittals.
   5. Pending modifications affecting the Work and the Contract Time.

I. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate final completion percentage for each activity.

J. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

K. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.
   1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.8 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow.
   7. Testing and inspection.
   8. Accidents.
   9. Meetings and significant decisions.
   10. Unusual events.
   11. Stoppages, delays, shortages, and losses.
   12. Meter readings and similar recordings.
   13. Emergency procedures.
   14. Orders and requests of authorities having jurisdiction.
   15. Change Orders received and implemented.
   16. Construction Change Directives received and implemented.
   17. Services connected and disconnected.
   18. Equipment or system tests and startups.
   19. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
   1. Material stored prior to previous report and remaining in storage.
   2. Material stored prior to previous report and since removed from storage and installed.
   3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
   1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.
4. Preconstruction video recordings.
5. Periodic construction video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.
   1. Submit photos by uploading to web-based project software site. Include copy of key plan indicating each photograph's location and direction.
   2. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name and contact information for photographer.
      c. Name of Architect.
      d. Name of Contractor.
      e. Date photograph was taken.
      f. Description of location, vantage point, and direction.
      g. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within seven days of recording.
   1. Submit video recordings by uploading to web-based project software site. Include copy of key plan indicating each video's location and direction.
   2. Identification: With each submittal, provide the following information in file metadata tag:
      a. Name of Project.
      b. Name and address of photographer.
      c. Name of Architect.
      d. Name of Contractor.
      e. Date video recording was recorded.
      f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.3 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full

high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.

C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Metadata: Record accurate date and time from camera.

E. File Names: Name media files with date, Project area, and sequential numbering suffix.

1.4 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs with maximum depth of field and in focus.
   1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Preconstruction Photographs: Before starting the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by.
   1. Flag construction limits before taking construction photographs.
   2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
   3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
   4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

C. Periodic Construction Photographs: Take 20 photographs monthly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

D. Time-Lapse Sequence Construction Photographs: Take 20 photographs as indicated, to show status of construction and progress since last photographs were taken.
   1. Frequency: Take photographs monthly, on the same date each month.
   2. Vantage Points: Following suggestions by Architect and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse sequence as follows:
      a. Commencement of the Work, through completion of subgrade construction.
      b. Above-grade structural framing.
      c. Exterior building enclosure.
      d. Interior Work, through date of Substantial Completion.

E. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

1.5 CONSTRUCTION VIDEO RECORDINGS

A. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.
2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

B. Preconstruction Video Recording: Before starting the Work, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.
1. Flag construction limits before recording construction video recordings.
2. Show existing conditions adjacent to Project site before starting the Work.
3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of the Work.
4. Show protection efforts by Contractor.

C. Periodic Construction Video Recordings: Record video recording monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 minutes.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect'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 Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of 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 Architect 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.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   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 Architect's final release or approval.
      g. Scheduled dates for purchasing.
      h. Scheduled date of fabrication.
      i. Scheduled dates for installation.
      j. Activity or event number.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:
   1. Project name.
   2. Date.
   3. Name of Architect.
   4. Name of Contractor.
   5. Name of firm or entity that prepared submittal.
   6. Names of subcontractor, manufacturer, and supplier.
   7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
   8. Category and type of submittal.
   9. Submittal purpose and description.
   10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
   11. Drawing number and detail references, as appropriate.
   12. Indication of full or partial submittal.
   13. Location(s) where product is to be installed, as appropriate.
   14. Other necessary identification.
   15. Remarks.
   16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.

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 concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect 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 Architect'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 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect 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 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. 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 Architect's action stamp.

E. 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.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are unsuitable 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 that show 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 Shop Drawings, and before or concurrent with Samples.

B. 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 unless submittal based on Architect's digital data drawing files is otherwise permitted.

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. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
      a. Project name and submittal number.
      b. Generic description of Sample.
      c. Product name and name of manufacturer.
      d. Sample source.
      e. Number and title of applicable Specification Section.
      f. Specification paragraph number and generic name of each item.
   3. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
   4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
   5. 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.
   6. 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(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
      a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:
1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
2. 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.
3. 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.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. 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.

H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.7 MATERIAL SAFETY DATA SHEETS (MSDS)

A. Unless submittal of a Material Safety Data Sheet is specifically required in a Division 02 to 33 Section to confirm compliance with VOC content of materials or LEED certification requirements, Material Safety Data Sheets are not to be submitted. MSDS are not subject to Architect's review.

B. Contractor remains solely responsible for job site safety controls, procedures, and programs. Submit Material Safety Data Sheets directly to Owner as part of Closeout Submittals unless otherwise directed. If submitted to Architect, the Architect will not review this information and will return it with no action taken.

1.8 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 insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF 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 Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project.
    1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals 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 Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project software. Include 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.
   1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
   1. Submittals by Web-Based Project Software: Architect will indicate, on Project software website, the appropriate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
   4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements, consisting of multiple products, assemblies, and subassemblies.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency

qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 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 Architect.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups.
   1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
   2. Indicate manufacturer and model number of individual components.
   3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement 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, indicating that the products and systems are in compliance

with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
   1. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of commencement of the Work, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
   1. Project quality-control manager may also serve as Project superintendent.
   2. .

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation

of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
      d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
      e. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups of size indicated.
   2. Build mockups in location indicated or, if not indicated, as directed by Architect.
   3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
   5. Demonstrate the proposed range of aesthetic effects and workmanship.
   6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   8. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.
   1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.

E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
   1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
   2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
   3. Drinking water and private toilet.
   4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
   5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service overhead unless otherwise indicated.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one land-based telephone line(s) for each field office.
   1. At each telephone, post a list of important telephone numbers.
      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor's home office.
      d. Contractor's emergency after-hours telephone number.
      e. Architect's office.
      f. Engineers' offices.
      g. Owner's office.
      h. Principal subcontractors' field and home offices.

I. Electronic Communication Service: Provide the following:
   1. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions with wireless connectivity.
   2. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 1.0 Mbps upload and 15 Mbps download speeds at each computer.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.
   1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 requirements.
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touch up signs so they are legible at all times.

H. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Temporary Elevator Use:] See Section 14 21 23.16 "Machine Room-Less Electric Traction Passenger Elevators".

K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 01 10 00 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
   1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
   2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
   3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
   4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
   1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
   2. Paint and maintain appearance of walkway for duration of the Work.

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
   1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
   1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
   2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
   3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard and replace stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
      b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
      c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.3 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product

request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Architect's Approval of Submittal: As specified in Section 01 33 00 "Submittal Procedures."
b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.
3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
   a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
   a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
   a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
   a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
   a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
   1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with

requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
   2. Evidence that proposed product provides specified warranty.
   3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   4. Samples, if requested.

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Coordination of Owner-installed products.
   6. Progress cleaning.
   7. Starting and adjusting.
   8. Protection of installed construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two copies signed by land surveyor.

E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding.

Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
   2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
   2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
   3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
   1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
   2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.
   1. Comply with Section 01 77 00 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at final completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit testing, adjusting, and balancing records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

5. Submit final completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect
      d. Name of Contractor.
      e. Page number.

   4. Submit list of incomplete items in the following format:
      a. Web-based project software upload. Utilize software feature for creating and updating list of incomplete items (punch list).

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
   1. Submit on digital media acceptable to Architect.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
    q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory manuals.
   2. Emergency manuals.
   3. Systems and equipment operation manuals.
   4. Systems and equipment maintenance manuals.
   5. Product maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:
   1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
   1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Architect.
   7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
   1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
   2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
   3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.
   3. Gas leak.
   4. Water leak.
   5. Power failure.
   6. Water outage.
   7. System, subsystem, or equipment failure.
   8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:
   1. Instructions on stopping.
   2. Shutdown instructions for each type of emergency.
   3. Operating instructions for conditions outside normal operating limits.
   4. Required sequences for electric or electronic systems.
   5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit PDF electronic files of scanned record prints and one of file prints.
         2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit PDF electronic files of scanned record prints and one set(s) of prints.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.

d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
   a. See Section 01 31 00 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
   b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
3. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect.

e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

C. Format: Submit record Product Data as annotated PDF electronic file.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible

condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.5 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
      h. Performance curves.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.
      b. Systems and equipment operation manuals.
      c. Systems and equipment maintenance manuals.
      d. Product maintenance manuals.
      e. Project Record Documents.
      f. Identification systems.
      g. Warranties and bonds.
      h. Maintenance service agreements and similar continuing commitments.
   3. Emergencies: Include the following, as applicable:
      a. Instructions on meaning of warnings, trouble indications, and error messages.
      b. Instructions on stopping.
      c. Shutdown instructions for each type of emergency.
      d. Operating instructions for conditions outside of normal operating limits.
      e. Sequences for electric or electronic systems.
      f. Special operating instructions and procedures.
   4. Operations: Include the following, as applicable:
      a. Startup procedures.
      b. Equipment or system break-in procedures.
      c. Routine and normal operating instructions.
      d. Regulation and control procedures.
      e. Control sequences.
      f. Safety procedures.

g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

1.6 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.7 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected site elements.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

D. Predemolition Photographs or Video: Submit before Work begins.

1.6 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of campus immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
2. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to 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 demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 03 30 35

UNDER SLAB SHEET VAPOR RETARDER

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Sheet materials for controlling vapor diffusion through concrete slabs-on-grade.

1.2 SUBMITTALS

A. Written certification from the manufacturer that the materials and their application as noted in this Specification and on the Drawings is appropriate and approved for this project.

B. Product Data: Manufacturer's product data, specifications, and installation instructions. Include vapor barrier manufacturer's requirements for placement, seaming and pipe book installation.

C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

D. Submit evidence that Installer’s existing company has minimum of 5-years continuous experience in application of specified materials.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer (applicator) who is acceptable to manufacturer, who has completed applications similar in material and extent to that required for this Project, and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Vapor Barrier and components to be from one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and application.

B. Store materials in a clean dry location in accordance with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

C. Stack membrane on elevated wood platform to eliminate warping.

D. Protect materials during handling and application to prevent damage or contamination.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written recommendations for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting materials performance. Do not apply on frozen ground.

B. Close areas to traffic during application and for time period after application recommended in writing by manufacturer.

1.6 COORDINATION

A. Coordinate placement of sheet vapor barrier with Division 03 sections.

B. Coordinate placement of sealer and hardener with Division 03 sections and with requirements of finish flooring products, including adhesives, specified in Division 09 Sections.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Vapor Barrier:
   1. Type: 15 mil polyolefin film meeting requirements of ASTM E 1745, Class A.
   2. Water Vapor Transmittance (After mandatory condition per ASTM E154 sections 08,11,12,13): Maximum perm rating of 0.01 as tested in accordance with ASTM E 1745 Section 07.
   3. Strength: ASTM E 1745: Class A.

B. Acceptable Products:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Alumiseal; Zero-Perm Vapor Barrier.
      b. Fortifiber Building Systems Group; Moistop Ultra 15.
      c. Meadows, W. R., Inc.; Perminator 15 mil.
      d. Raven Industries Inc.; VaporBlock 15.
      e. Stego Industries, LLC; Stego Wrap 15 mil Class A.

C. Accessories:
   1. Bonding Agent: Manufacturer's approved or recommended vapor barrier bonding agent.
   2. Sealing and Seaming Tape: High density polyethylene tape a minimum of 4 inches in width, compatible with vapor barrier membrane, and manufactured by or recommended by vapor barrier membrane manufacturer. Tape for joints shall have at least the same permeability rating as the vapor barrier specified.
   3. Vapor Proofing Mastic: Manufacturer's approved or recommended vapor proofing mastic with the same permeability rating as the vapor barrier specified.
   4. Pipe Boot: Construct pipe boots from vapor barrier material and pressure sensitive tape in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 PREPARATION

A. Level or tamp or roll aggregate, sand or granular base.

3.3 INSTALLATION

A. Vapor Barrier:
   1. Place, protect, and repair vapor barrier sheets according to ASTM E 1643 and manufacturer's written instructions.

2. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour.
3. Install vapor barrier without tears, voids, and holes. Lap ends and edges as recommended by manufacturer, but not less than 6 inches over adjacent sheets. Seal laps with tape.
4. Turn up sheets at perimeter, at footings and vertical walls, and against penetrations, and seal joints with tape.
5. Seal joints, tears, holes, perimeter, and penetrations through vapor with tape in accordance with manufacturer's recommendations.
6. Point exposed edges with pointing mastic to prevent water from traveling under membrane.
7. Adhere membrane to vertical surfaces with adhesive.

3.4 PROTECTION

A. Protect complete membrane from damage. Prior to pouring concrete, inspect membrane for punctures or damage and repair as required to maintain vapor barrier integrity.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 - GENERAL

A. Section Includes:
1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:
1. Steel lintels in unit masonry.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:
1. Masonry units.
   a. Include data on material properties.
   b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Mortar admixtures.
4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Grout mixes. Include description of type and proportions of ingredients.
6. Reinforcing bars.
7. Joint reinforcement.
8. Metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
   2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
   1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
   2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
   1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide bullnose units for outside corners unless otherwise indicated.

B. CMUs: ASTM C90.
   1. Density Classification: Lightweight unless indicated otherwise.
   2. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

E. Aggregate for Grout: ASTM C404.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
      a. BASF Aktiengesellschaft; MasterSet FP 20.
      b. Euclid Chemical Company (The); an RPM International company; ACCELGUARD 80.
      c. GCP Applied Technologies Inc., MORSET.

G. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
   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. Dur-O-Wal; a Hohmann & Barnard company.
      b. Heckmann Building Products, Inc.
      c. Hohmann & Barnard, Inc.
      d. Lock Rite.
      e. Wire-Bond.

C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
   1. Exterior Walls: Hot-dip galvanized carbon steel.
   2. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
   3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
   4. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
   5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
   6. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane , or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   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. Diedrich Technologies, Inc., a Hohmann & Barnard company.
      b. EaCo Chem, Inc.
      c. PROSOCO, Inc.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.

2. Use portland cement-lime mortar unless otherwise indicated.
3. For reinforced masonry, use portland cement-lime mortar.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
   3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
   6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
   7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
   2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
   3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
   4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
   5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

F. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Install preformed control-joint gaskets designed to fit standard sash block.

3.8 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.12 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal ladders.
4. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:
1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for all items listed in summary above:
1. Include shop drawings and structural analysis data signed and sealed by the qualified professional engineer licensed to practice in the location of the project, demonstrating the design and connections will meet all indicated and code required loads.

C. Delegated Design: Provide shop drawings signed and sealed by a structural engineer licensed to practice in the location of the project, indicating ability of system and attachment to supporting construction to resist indicated or code required loads.

D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 2 (A4).

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

F. Post-Installed Anchors: Torque-controlled expansion anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting" and Section 09 91 23 “Interior Painting."

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3.

B. Steel Ladders:
   1. Space siderails 16 inches (406 mm) apart unless otherwise indicated.
   2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
   3. Rungs: 3/4-inch- (19-mm-) diameter steel bars.
   4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
   6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Harsco Industrial IKG, a division of Harsco Corporation; Mebac.
         2) ROSS TECHNOLOGY CORP.; Algrip Slip-Resistant Ladder Rungs - Carbon Steel.
         3) SlipNOT Metal Safety Flooring; W.S. Molnar Company; SlipNOT.
   7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
   8. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
   9. Galvanize exterior ladders, including brackets.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.11 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
   1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 13 "Exterior Painting." and Section 09 91 23 "Interior Painting."

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood blocking, cants, and nailers.
   2. Wood furring and grounds.
   3. Plywood backing panels.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Power-driven fasteners.
   4. Post-installed anchors.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory-mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
   3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
   2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
   1. Treatment shall not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:
1. Concealed blocking.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Nailers.
3. Cants.
4. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
1. Mixed southern pine or southern pine; SPIB.
2. Western woods; WCLIB or WWPA.
3. Northern species; NLGA.
4. Eastern softwoods; NeLMA.

C. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NELMA.
3. Northern species, No. 2 Common grade; NLGA.
4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.
   1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.

G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

J. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
   2. ICC-ES evaluation report for fastener.

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally and vertically at 24 inches (610 mm) o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Modified bituminous sheet waterproofing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
   1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.
      a. Size: 100 sq. ft. (9.3 sq. m) in area.
      b. Description: Each type of wall installation.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil-(0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side[**; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction**].
   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. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
      b. CETCO, a Minerals Technologies company; Envirosheet.
      c. GCP Applied Technologies Inc.; Bituthene 3000.
      d. MAPEI Corporation; Mapethene(TM) HT.
      e. Polyguard Products, Inc.; Polyguard 650 Membrane.
      f. Protecto Wrap Company; PW-100/60.
      g. W. R. Meadows, Inc; Mel-Rol .
   2. Physical Properties:
      a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
      b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
      c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970/D 1970M.
      d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836/C 836M.
      e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154/E 154M.

f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
g. Water Vapor Permeance: 0.05 perm (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
h. Hydrostatic-Head Resistance: 200 feet (60 m) minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm), predrilled at 9-inch (229-mm) centers.

G. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
1. Thickness: Nominal 1/8 inch (3 mm).
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel with Polymeric Film: Composite subsurface drainage panel acceptable to waterproofing manufacturer and consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 21 gpm per ft. (112 to 261 L/min. per m).
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. American Hydrotech, Inc.; Hydrodrain 400.
b. BASF Corporation; Construction Systems; MasterSeal 975 (Pre-2014: Sonoshield DBS 6200).
c. Carlisle Coatings & Waterproofing Inc; CCW MiraDRAIN 6200.
d. GCP Applied Technologies Inc.; Hydroduct 220.
e. Polyguard Products, Inc.; Polyflow 10-P.
f. W. R. Meadows, Inc.; Mel-Drain 5035-B.

B. Molded-Sheet Collector-Panel System with Polymeric Film: Composite subsurface collector-panel system by same manufacturer as primary molded-sheet drainage panels; consisting of a high-profile, studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven-geotextile facing with an apparent opening size not exceeding No. 40 (0.425-mm) sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 17 gpm per ft. (112 to 211 L/min. per m) and a minimum horizontal, in-plane flow rate as indicated on Drawings. Provide system with manufacturer's outlets, connectors, tapes, and other accessories to connect primary molded-sheet drainage panels with piped subdrainage system.
   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. GCP Applied Technologies Inc.; Hydroduct Coil 600.
      b. Polyguard Products, Inc.; Totalflow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.
   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
   1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:
      a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
      b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
   1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

E. Seal edges of sheet-waterproofing terminations with mastic.

F. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

H. Immediately install protection course with butted joints over waterproofing membrane.
   1. Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
   1. For vertical applications, install protection course before installing drainage panels.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

B. Waterproofing will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

SECTION 07 24 19

WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. EIFS-clad drainage-wall assemblies that are field applied over substrate.
2. Water-resistive barrier coatings.

1.2 DEFINITIONS

A. Definitions in ASTM E 2110 apply to Work of this Section.

B. EIFS: Exterior insulation and finish system(s).

C. IBC: International Building Code.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each EIFS component, trim, and accessory, including water-resistive barrier coatings.

B. Shop Drawings:
1. Include details for EIFS buildouts.
2. Include details for parapet cap flashing.

C. Samples: For each exposed product and for each color and texture specified, 8 inches (200 mm) square in size.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates: Signed by EIFS manufacturer, certifying the following:
1. EIFS complies with requirements.
2. Substrates to which EIFS is indicated to be attached are acceptable to EIFS manufacturer.
3. Accessory products installed with EIFS, including flashing, water-resistive barrier coatings, trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer.

C. Product Certificates: For insulation and joint sealant, from manufacturer.

D. Product Test Reports: For each EIFS assembly and component, and for water-resistive barrier coatings, for tests performed by a qualified testing agency.

E. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For EIFS to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by AWCI International as qualified to install Class PB EIFS using trained workers.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to set quality standards for fabrication and installation.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
   1. Stack insulation board flat and off the ground.
   2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.
   1. Proceed with installation of adhesives or coatings only when ambient temperatures have remained, or are forecast to remain, above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after application. Do not apply EIFS adhesives or coatings during rainfall.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Bond integrity and weathertightness.

b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.

2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:
   a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
   b. Insulation installed as part of EIFS including foam buildouts.
   c. Insulation adhesive.
   d. EIFS accessories, including trim components and flashing.
   e. Water-resistive barrier coatings.
   f. EIFS drainage components.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. BASF Corporation; Wall Systems.
   2. Dryvit Systems, Inc.
   3. Parex USA, Inc.
   4. Sto Corp.

B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with EIFS components.

2.2 PERFORMANCE REQUIREMENTS

A. EIFS Performance: Comply with ASTM E 2568 and with the following:
   1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.
   2. System Fire Performance: Fire-resistance rating of wall assembly.
   3. Structural Performance of Assembly and Components:
      a. Wind Loads: Uniform pressure as indicated on Drawings.
   4. Impact Performance: ASTM E 2568, Standard impact resistance unless otherwise indicated.
   5. Abrasion Resistance of Finish Coat: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for a minimum of 28 days and shows no cracking, checking, or loss of film integrity after exposure to 528 quarts (500 L) of sand when tested according to ASTM D 968, Method A.
   6. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch (50.8-by-50.8-mm) clean glass substrate; cured for 28 days and shows no growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274.
   7. Drainage Efficiency: 90 percent average minimum when tested according to ASTM E 2273.

2.3 EIFS MATERIALS

A. Water-Resistive Barrier Coating: EIFS manufacturer's standard formulation and accessories for use as water-resistive barrier coating; compatible with substrate.
   1. Water-Resistance: Comply with physical and performance criteria of ASTM E 2570/E 2570M.

B. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt, and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.

C. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; specifically formulated to be applied to back side of insulation in a manner that creates open vertical channels designed to serve as an integral part of the water-drainage system of the EIFS-clad drainage-wall assembly; compatible with substrate; and complying with one of the following:
1. Job-mixed formulation of portland cement complying with ASTM C 150/C 150M, Type I, and polymer-based adhesive specified for base coat.
2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.

D. Molded, (Expanded) Rigid Cellular Polystyrene Board Insulation: Comply with ASTM E 2430/E 2430M, unless otherwise noted, and the following:
1. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E 84.
2. Dimensions: Provide insulation boards of not more than 24-by-48 inches (610-by-1219 mm), with thickness indicated on Drawings.
3. Foam Buildouts: Provide with profiles and dimensions indicated on Drawings.

E. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) according to ASTM E 2098/E 2098M and the following:
1. Reinforcing Mesh for EIFS, General: Not less than weight required to comply with impact-performance level specified in "Performance Requirements" Article.
2. Strip-Reinforcing Mesh: Not less than 3.75 oz./sq. yd. (127 g/sq. m).
3. Detail-Reinforcing Mesh: Not less than 4.0 oz./sq. yd. (136 g/sq. m).
4. Corner-Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m).
5. High-Impact Reinforcing Mesh: Not less than 15 oz./sq. yd.509 g/sq. m.

F. Base Coat: EIFS manufacturer's standard mixture complying with one of the following:
1. Job-mixed formulation of portland cement complying with ASTM C 150/ C 150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
3. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

G. Water-Resistant Base Coat: EIFS manufacturer's standard water-resistant formulation complying with one of the following:
1. Job-mixed formulation of portland cement complying with ASTM C 150/C 150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.

H. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

I. Finish Coat: EIFS manufacturer's standard acrylic-based coating complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
2. Colors: As selected by Architect from manufacturer's full range.
3. Textures: As selected by Architect from manufacturer's full range.

J. Water: Potable.

K. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard cell class for use intended, and ASTM C 1063.
1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
3. Weep Screed/Track: Prefabricated, one-piece type for attachment behind insulation with perforated face leg extended to form a drip and weep holes in track bottom, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of EIFS with drainage.
4. Expansion Joint: Closed-cell polyethylene backer rod and elastomeric sealant 3/4-inch-(19-mm-) minimum.

2.4 MIXING

A. Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials, except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

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 roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.

C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.3 EIFS INSTALLATION, GENERAL

A. Comply with ASTM C 1397, ASTM E 2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 SUBSTRATE PROTECTION APPLICATION

A. Water-Resistive Barrier Coating: Apply over CMU to provide a water-resistive barrier.
   1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.

B. Flexible-Membrane Flashing: Install over water-resistive barrier coating, applied and lapped to shed water; seal at openings, penetrations, and terminations. Prime substrates with flashing primer if required and install flashing.

3.5 TRIM INSTALLATION

A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at windowsills, and elsewhere as indicated. Coordinate with installation of insulation.
   1. Weep Screed/Track: Use at bottom termination edges, at window and door heads of water-drainage EIFS unless otherwise indicated.
   2. Expansion Joint: Use where indicated on Drawings.
   3. Casing Bead: Use at other locations.

3.6 INSULATION INSTALLATION

A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C 1397 and the following:
   1. Apply adhesive to insulation by notched-trowel method, with notches oriented vertically to produce drainage channels that remain functional after the insulation is adhered to substrate.
   2. Press and slide insulation into place. Apply pressure over entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
   3. Allow adhered insulation to remain undisturbed for not less than 24 hours, before beginning rasping and sanding insulation or applying base coat and reinforcing mesh.
   4. Apply insulation over substrates in courses with long edges of boards oriented horizontally.
   5. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.
   6. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints, so no piece of insulation is less than 12 inches (300 mm) wide or 6 inches (150 mm) high. Offset joints not less than 6 inches (150 mm) from corners of window and door openings and not less than 4 inches (100 mm) from aesthetic reveals.
      a. Adhesive Attachment: Offset joints of insulation not less than 6 inches (150 mm) from horizontal and 4 inches (100 mm) from vertical joints in sheathing.
   7. Interlock ends at internal and external corners.

8. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch (1.6 mm) occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
9. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
10. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch (0.8 mm) from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm). Prevent airborne dispersal and immediately collect insulation raspings or sandings.
11. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch (19 mm).
12. Install foam buildouts and attach to structural substrate by adhesive.
13. Interrupt insulation for expansion joints where indicated.
14. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
15. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
16. Before installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches (64 mm) over front and back face unless otherwise indicated on Drawings.
17. Treat exposed edges of insulation as follows:
    a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
    b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
    c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
18. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and water-resistive barrier coating.

B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
1. At expansion joints in substrates behind EIFS.
2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
3. Where wall height or building shape changes.
4. Where EIFS manufacturer requires joints in long continuous elevations.

3.7 BASE-COAT APPLICATION

A. Water-Resistant Base Coat: Apply full-thickness coverage to exposed insulation and to exposed surfaces of sloped shapes and to other surfaces indicated on Drawings.

B. Base Coat: Apply full coverage to exposed insulation and foam build-outs with not less than 1/16-inch (1.6-mm) dry-coat thickness.

C. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397. Do not lap reinforcing mesh within 8 inches (200 mm) of corners. Completely embed mesh, applying additional basecoat material if necessary, so reinforcing-mesh color and pattern are invisible.
   1. High-impact reinforcing mesh from ground level to a point approximately 9 feet above grade stopping only at a joint or reveal.

D. Double-Layer Reinforcing-Mesh Application: Where indicated or required, apply second base coat and second layer of reinforcing mesh, overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397 in same manner as first application. Do not apply until first base coat has cured.

E. Additional Reinforcing Mesh: Apply strip-reinforcing mesh around openings, extending 4 inches (100 mm) beyond perimeter. Apply additional 9-by-12-inch (230-by-300-mm) strip-reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- (200-mm-) wide, strip-reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches (100 mm) on each side of corners.
   1. At aesthetic reveals, apply strip-reinforcing mesh not less than 8 inches (200 mm) wide.
   2. Embed strip-reinforcing mesh in base coat before applying first layer of reinforcing mesh.
   3. Provide heavy-duty

F. Foam Buildouts: Fully embed reinforcing mesh in base coat.

G. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.

3.8 FINISH-COAT APPLICATION

A. Primer: Apply over dry base coat.

B. Finish Coat: Apply full-thickness coverage over dry primed base coat, maintaining a wet edge at all times for uniform appearance, to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
   1. Embed aggregate in finish coat to produce a uniform applied-aggregate finish of color and texture matching approved sample.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. EIFS Tests and Inspections: According to ASTM E 2359/E 2359M.

C. EIFS will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Mechanically fastened, thermoplastic polyolefin (TPO) roofing system.
2. Roof insulation.
3. Cover board.
4. Walkways.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.

5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:
1. Roof membrane and flashings, of color required.
2. Walkway pads or rolls, of color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:
1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
a. Submit evidence of compliance with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field Test Reports:
1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
   2. Warranty Period: 20years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products, for the following warranty period:
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
   1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
   1. Zone 1 (Roof Area Field): In accordance with local conditions and code.
   2. Zone 2 (Roof Area Perimeter): In accordance with local conditions and code.
   3. Zone 3 (Roof Area Corners): In accordance with local conditions and code.

D. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70and an emissivity of not less than 0.75 when tested according to CRRC-1.

F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

A. TPO Sheet: ASTM D 6878/D 6878M, internally fabric- or scrim-reinforced, TPO sheet.
   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. Carlisle SynTec Incorporated.
      b. Firestone Building Products.
      c. GAF.
      d. Johns Manville; a Berkshire Hathaway company.
   2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
   3. Thickness: 60 mils (1.5 mm), nominal.
   4. Exposed Face Color: White.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Roof Vents: As recommended by roof membrane manufacturer.
   1. Size: Not less than 4-inch (100-mm) diameter.

E. Bonding Adhesive: Manufacturer's standard.

F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

G. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05-inch-thick (25 mm wide by 1.3 mm thick), prepunched.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   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. Atlas Roofing Corporation.
      b. Carlisle SynTec Incorporated.
      c. Firestone Building Products.
      d. GAF.
      e. Johns Manville; a Berkshire Hathaway company.
      f. Rmax, Inc.
   2. Compressive Strength: 20 psi (138 kPa).
   3. Size: 48 by 48 inches (1219 by 1219 mm).
   4. Thickness: As indicated on Drawings but no less than minimum required by building code (continuous insulation) Long Term Thermal Resistance (LTTR) value as determined in accordance with CAN/ULC-S770 and the corresponding thickness required to meet this minimum requirement.

C. Tapered Insulation: Provide factory-tapered insulation boards.
   1. Material: Match roof insulation.
   2. Minimum Thickness: 1/4 inch (6.35 mm).
   3. Slope:
      a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
      b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M fiber-reinforced gypsum board.
   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. CertainTeed Corporation.
      b. Georgia-Pacific Building Products.
      c. National Gypsum Company.
      d. United States Gypsum Company.
   2. Thickness: 1/2 inch (13 mm).
   3. Surface Finish: Factory primed.

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.
   1. Size: Approximately 36 by 60 inches (914 by 1524 mm).
   2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
   1. Submit test result within 24 hours after performing tests.
      a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

3.4 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Metal Decking:
   1. Install base layer of insulation with joints staggered not less than 24 inches (610 mm) in adjacent rows.
      a. Locate end joints over crests of decking.
      b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
      c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
      d. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
      e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
         1) Trim insulation so that water flow is unrestricted.
      f. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
      g. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
   2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
      a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.
      b. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
      c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
      d. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
      e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
         1) Trim insulation so that water flow is unrestricted.
      f. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
      g. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

3.5 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.
   1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   2. At internal roof drains, conform to slope of drain sump.
      a. Trim cover board so that water flow is unrestricted.
   3. Cut and fit cover board tight to nailers, projections, and penetrations.

B. Install slip sheet over cover board and beneath roof membrane.

3.6 MECHANICALLY FASTENED ROOFING INSTALLATION

A. Mechanically fasten roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. For in-splice attachment, install roof membrane with long dimension perpendicular to steel roof deck flutes.

D. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

E. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

F. Mechanically fasten or adhere roof membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within seam, and mechanically fasten TPO sheet to roof deck.

I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and flashing sheet.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 WALKWAY INSTALLATION

A. Flexible Walkways:
1. Install flexible walkways at the following locations:
   a. Perimeter of each rooftop unit.
   b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
   c. Top and bottom of each roof access ladder.
   d. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
   e. Locations indicated on Drawings.
   f. As required by roof membrane manufacturer's warranty requirements.
2. Provide 6-inch (76-mm) clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Owner will engage a qualified testing agency to perform the following tests:
1. Flood Testing: Flood test each roof area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   a. Perform tests before overlying construction is placed.
   b. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of base flashing.
   c. Flood each area for 48 hours.
   d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
      1) Cost of retesting is Contractor's responsibility.
   e. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Formed equipment support flashing.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 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 each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish.

1.4 INFORMATIONAL SUBMITTALS

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.6 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth,flatsurface.
   1. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply

coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: As selected by Architect from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
1. Finish:As selected by Architect.

D. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A 755/A 755M.
1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
   a. GCP Applied Technologies Inc.; Ultra.
   b. Polyguard Products, Inc.; Deck Guard HT.
2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
   1. Hanger Style: As indicated.
   2. Fabricate from the following materials:
      a. Aluminum: 0.024 inch (0.61 mm) thick.

B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm)thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm) thick.

B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

C. Flashing Receivers: Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

E. Roof-Drain Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.
   6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
   1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
   2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
   2. Connect downspouts to underground drainage system.

C. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   1. Loosely lock front edge of scupper with conductor head.
   2. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below scupper discharge.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 62 10

FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Formed Products: Concealed flashing within wall assemblies to protect and shed incidental water to the exterior that is not specified as part of the air/moisture barrier system.

1.2 PERFORMANCE REQUIREMENTS

A. General: Flashing and trim assemblies as indicated shall withstand structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
   1. Submit documentation of compatibility with air/moisture barrier.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store flashing materials in contact with other materials that might cause staining, denting, or other surface damage. Store flashing materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 FLEXIBLE FLASHING

A. Self-Adhesive flexible flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mils.
   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. Advanced Building Products Inc.; Strip-N-Flash.

b. Carlisle Coatings & Waterproofing; CCW-705 Air & Vapor Barrier Strips.
c. GCP Applied Technologies Inc.; Perm-A-Barrier Detail Membrane.
d. Henry; Blueskin SA

2.2 HIGH TEMPERATURE FLASHING

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by manufacturer.
1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
b. GCP Applied Technologies Inc.; Ultra.
c. Henry Company; Blueskin PE200 HT.
d. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, separators, sealants, and other miscellaneous items as required for complete metal flashing installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FLASHING INSTALLATION

A. General: Install as indicated on Drawings and per Manufacturer's recommendations.

B. Self-Adhering Sheet Flashing: Install self-adhering sheet flashing, wrinkle free. Apply primer if required by flashing manufacturer. Comply with temperature restrictions of flashing manufacturer for installation. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover flashing with subsequent construction within 14 days.

C. Location:
   1. Flexible Flashing: As indicated on drawings, or at all exterior windows, doors or other penetrations where high temperature flashing is not required.
   2. High Temperature Flashing: As indicated on drawings, or at all locations where flashing will be in contact with metal coping or metal panels where high temperatures exist.

END OF SECTION

SECTION 07 71 00

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Copings.
   2. Reglets and counterflashings.

B. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
   2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.
   1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
   2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   4. Detail termination points and assemblies, including fixed points.
   5. Include details of special conditions.

C. Samples for Verification:
   1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
   2. Include copings made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are SPRI ES-1 tested to specified design pressure.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.
   1. Build mockup of typical roof edge, including downspout, approximately 10 feet (3.0 m) long, including supporting construction, seams, attachments, and accessories.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in roofing section."

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:
   1. Design Pressure: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hickman Company, W. P.
      b. Merchant & Evans, Inc.
      c. Metal-Era, Inc.
      d. Petersen Aluminum Corporation.
   2. Formed Aluminum Sheet Coping Caps: Aluminum sheet, 0.040 inch (1.02 mm) thick.
      a. Surface: Smooth, flat finish.
      b. Finish: Two-coat fluoropolymer.
      c. Color: Custom color as selected by Architect to match adjacent brick As selected by Architect from manufacturer's full range.
   3. Corners: Factory mitered and continuously welded.
   4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
      a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches (300 mm) wide, with integral cleats.

2.3 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Castle Metal Products.
   2. Cheney Flashing Company.
   3. Fry Reglet Corporation.
   4. Heckmann Building Products Inc.
   5. Hickman Company, W. P.
   6. Keystone Flashing Company, Inc.
   7. Metal-Era, Inc.
   8. Metal-Fab Manufacturing, LLC.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
   1. Formed Aluminum: 0.024 inch (0.61 mm) thick.
   2. Corners: Factory mitered andmechanically clinched and sealed watertight.
   3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) and in lengths not exceeding 12 feet (3.6 m) designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
   1. Formed Aluminum: 0.032 inch (0.81 mm) thick.

D. Accessories:
   1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
   2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Aluminum Finish: Two-coat fluoropolymer.
   1. Color: As selected by Architect from manufacturer's full range.

2.4 MATERIALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

2.5 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970/D 1970M; stable after testing at 240 deg F (116 deg C).
   2. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F (29 deg C).

B. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
   2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos-free, of consistency required for application.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: 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.

D. Coil-Coated Galvanized Steel Sheet Finishes:
   1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A 755/A 755M and coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
   1. Apply continuously under copings.
   2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

B. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
   1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
   2. Provide uniform, neat seams with minimum exposure of solder and sealant.
   3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
   4. Torch cutting of roof specialties is not permitted.
   5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
   1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
   2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.4 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
   1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch (762-mm) centers.

3.5 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches (100 mm) over top edge of base flashings.

C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches (100 mm) over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

1.1 SUMMARY

A. Section Includes:
1. Roof curbs.
2. Equipment supports.
3. Pipe and duct supports.
4. Pipe portals.

1.2 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.
1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Delegated-Design Submittal: For roof curbs 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 mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.5 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design roof curbs to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Curbs Plus, Inc.
   b. LM Curbs.
   c. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
   d. Pate Company (The).
   e. Thybar Corporation.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Material: Zinc-coated (galvanized-) steel sheet, 0.052 inch (1.32 mm) thick.

1. Finish: Mill phosphatized.

D. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
4. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
5. Liner: Same material as curb, of manufacturer's standard thickness and finish.
6. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
7. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.

8. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
9. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.
10. Damper Tray: Provide damper tray or shelf with opening 3 inches (76 mm).

2.3 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced perimeter metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, integral metal cant, and integrally formed structure-mounting flange at bottom.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Curbs Plus, Inc.
b. LM Curbs.
c. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
d. Pate Company (The).
e. Thybar Corporation.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Material: Zinc-Coated (Galvanized) Steel Sheet, 0.052 inch (1.32 mm) thick.
1. Finish: Mill phosphatized.

D. Construction:
1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches (90 mm) wide on top flange of equipment supports, continuous around support perimeter.
5. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
9. Fabricate equipment supports to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.

2.4 PIPE AND DUCT SUPPORTS

A. Fixed-Height Cradle-Type Pipe Supports: Polycarbonate pipe stand accommodating up to 1-1/2-inch- (38-mm-) diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

B. Fixed-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand with polycarbonate roller carrying assembly accommodating up to 7-inch- (178-mm-) diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

C. Adjustable-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand base, pipe support, and roller housing, with stainless-steel threaded rod designed for adjusting support height, accommodating up to 18 inch (457 mm) diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

D. Adjustable-Height Structure-Mounted Pipe Supports: Extruded-aluminum tube, filled with urethane insulation; 2 inches (50 mm) in diameter; accommodating up to 7-inch- (178-mm-) diameter pipe or conduit, with provision for pipe retainer; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, stainless-steel roller and retainer, and extruded-aluminum carrier assemblies; as required for quantity of pipe runs and sizes.

E. Curb-Mounted Pipe Supports: Galvanized steel support with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom; with adjustable-height roller-bearing pipe support accommodating up to 20-inch- (508-mm-) diameter pipe or conduit and with provision for pipe retainer; as required for quantity of pipe runs and sizes.
   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. MIRO Industries, Inc.
      b. Pate Company (The).
      c. PHP Systems/Design.
      d. Thaler Metal Industries Ltd.

2.5 PIPE PORTALS

A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM protective rubber caps sized for piping indicated, with stainless-steel snaplock swivel clamps.
   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. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.

B. Flashing Pipe Portal: Formed aluminum membrane-mounting flashing flange and sleeve with collared opening and pressure-sealed conically shaped EPDM protective rubber cap sized for piping indicated, with stainless-steel snaplock swivel clamps.
   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. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.

2.6 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation and mill phosphatized for field painting where indicated.
   1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   2. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.
   1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   2. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

F. Steel Tube: ASTM A 500**/**A 500M, round tube.

G. Galvanized-Steel Tube: ASTM A 500**/**A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

H. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.7 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.

C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for above-ground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187**/**D 1187M.

F. Underlayment:
1. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
2. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
3. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
5. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D 4586**/**D 4586M, asbestos-free, of consistency required for application.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
   1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
   2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
   3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
   4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
   3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.
   1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

F. Preformed Flashing-Sleeve and Flashing Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

G. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 91 13 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Nonstaining silicone joint sealants.
2. Urethane joint sealants.
3. Butyl joint sealants.
4. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

C. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

D. Field-Adhesion-Test Reports: For each sealant application tested.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
   3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone substrates.
   4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
   5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
   7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each kind of sealant and joint substrate.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.
   4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
      a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
         1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
   6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation;795.
      b. GE Construction Sealants; SilPruf NB.
      c. Pecora Corporation; 864NST.
      d. Tremco Incorporated; Spectrem 2.
      e. Sika Corporation; Silasil WS295.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Construction Chemicals, LLC, Building Systems; Sonalastic TX1.
      b. Pecora Corporation; Dynatrol I-XL.
      c. Sherwin-Williams Company (The); Stampede-1.
      d. Sika Corporation U.S.; Sikaflex Textured Sealant.
      e. Sika Corporation; Sikaflex 2c NS.
      f. Tremco Incorporated; Dymonic.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Construction Chemicals, LLC, Building Systems; Sonolastic SL 1.
      b. Pecora Corporation; NR-201.
      c. Sherwin-Williams Company (The); Stampede 1SL.
      d. Sika Corporation; Sikaflex 2c SL.

C. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.
   1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. LymTal International, Inc.; Iso-Flex 888QC.

2.4 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. C.R. Laurence Co, Inc.; CRL 777 Butyl Rubber (VOC: 240 g/L).
      b. Pecora Corporation; BC-158 (VOC: <250 g/L).
      c. Tremco Inc., Tremco CS&W Group; Butyl Sealant (VOC: 232 g/L)

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
      b. Pecora Corporation; AC-20.
      c. Sherwin-Williams Company (The); 850A.
      d. Tremco Incorporated; Tremflex 834.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

a. Alcot Plastics Ltd.; Alcot Plastics Backer Rod.
b. BASF Aktiengesellschaft; MasterSeal 920.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Construction Chemicals, LLC, Building Systems.
   b. Construction Foam Products, a division of Nomaco, Inc.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
      b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
   4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
   5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation and contraction joints in cast-in-place concrete slabs.

b. Joints between different materials listed above.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, M, P, 50, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces .
1. Joint Locations:
a. Construction joints in cast-in-place concrete.
b. Control and expansion joints in unit masonry.
c. Joints in exterior insulation and finish systems.
d. Joints between different materials listed above.
e. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
f. Control and expansion joints in ceilings and other overhead surfaces.
g. Other joints as indicated on Drawings.
2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors and elevator entrances.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Interior standard steel doors and frames.
   2. Exterior standard steel doors and frames.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
   7. Details of anchorages, joints, field splices, and connections.
   8. Details of accessories.
   9. Details of moldings, removable stops, and glazing.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.
   1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
   2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, section 7.2.1.15.4.
   3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

C. Field quality control reports.

1.7 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Ceco Door; ASSA ABLOY.
   b. Curries Company; ASSA ABLOY.
   c. DE LA FONTAINE.
   d. Fleming Door Products Ltd.; Assa Abloy Group Company.
   e. Gensteel Doors, Inc.
   f. Hollow Metal Xpress.
   g. Mesker Door Inc.
   h. Republic Doors and Frames.
   i. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

A. Thermally-Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. (2.84 W/K x sq. m) when tested according to ASTM C 518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B. .
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches (44.5 mm).
      c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
      d. Edge Construction: Model 2, Seamless.
      e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
      f. Core: Polyurethane.
   2. Frames:
      a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
      b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
      c. Construction: Face welded.
   3. Exposed Finish: Prime.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A. .
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches (44.5 mm).
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
      d. Edge Construction: Model 2, Seamless.
      e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
      f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
      g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
      h. Core: Polyurethane.
      i. Fire-Rated Core: Manufacturer's standard vertical steel stiffener with insulation core for fire-rated doors.
   2. Frames:
      a. Materials: Metallic-coated steel sheet, minimum thickness of 0.078 (1.99 mm), with minimum A60 (ZF180) coating.
      b. Construction: Full profile welded.
   3. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:
   1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.

2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.7 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with SDI A250.11.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
      a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
      b. Install frames with removable stops located on secure side of opening.
   2. Floor Anchors: Secure with postinstalled expansion anchors.
      a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
   3. Solidly pack mineral-fiber insulation inside frames.
   4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
   5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, section 5.2
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 CLEANING AND TOUCHUP

A. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 08 11 69

METAL STORM DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Metal storm fire-rated door and frame assembly systems.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Conform to the Federal Emergency Management Agency (FEMA) 320 AND 361 guidelines and ANSI ICC500 standards providing security and safety for tornado shelters and severe storm areas of refuge.
   1. Provide label on assembly denoting compliance with requirements.

2.2 MANUFACTURERS

A. Available Manufacturers:
   1. Amweld International, LLC.
   2. Ceco Door Products; an Assa Abloy Group company.
   3. Curries Company; an Assa Abloy Group company.
   4. Deansteel.
   5. Mesker Door Inc.
   6. Pioneer Industries, Inc.
   7. Republic Doors and Frames.
   8. Steelcraft; an Allegion.

B. Basis of Design: Steelcraft, PW14 Paladin Series Doors and FP14 Paladin Series Frames.

C. Source Limitations:
   1. Obtain interior hollow-metal work from single source from single manufacturer.
   2. Obtain exterior hollow-metal work from single source from single manufacturer.

2.3 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.4 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames SDI A250.8, Level 2.
   1. Physical Performance: Level B according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule on Drawings.
      b. Thickness: 1-3/4 inches (44.5 mm).
      c. Face: Galvannealed, cold-rolled steel sheet, minimum thickness of 0.67 inch (1.7 mm).
      d. Edge Construction: Model 2, Seamless.
      e. Core: Kraft-paper honeycomb with Vertical steel stiffener.
   3. Frames:
      a. Materials: Galvannealed steel sheet, minimum thickness of 0.067 inch (1.7 mm).
      b. Construction: Fully welded.
      c. Throat Width: Coordinate throat width with partition thickness, increase throat width to accommodate heavy gage metal studs.
      d. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchored.
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
   3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

H. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:
1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards (if required): Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
   1) Two anchors per jamb up to 60 inches (1524 mm) high.
   2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
   3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
   4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
   1) Three anchors per jamb up to 60 inches (1524 mm) high.
   2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
   3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
   4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
   4. Provide loose stops and moldings on inside of hollow-metal work.
   5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

G. Head Reinforcement: Provide minimum of 0.093-inch- (2.3-mm-) thick, steel channel or angle stiffener for opening widths more than 48 inches (1219 mm).

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

A. Grout Guards (if required): Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

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 embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
      a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
   3. Metal-Stud Partitions with Openings Requiring Ratings and Temperature-Rise Limits: Solidly pack mineral-fiber insulation inside frames.

4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. In-Place Metal -Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
2. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 – GENERAL:

1.01 SUMMARY:

A. Section includes the supply and installation of the Finish Hardware.

B. Related Sections
1. Openings – Division 8 / Division 8
2. Electrical – Division 16 / Division 26
3. Security – Division 16 / Division 28

1.02 REFERENCES:

A. Documents and Institutes that shall be used in estimating, detailing and installing the items specified.

1. International Building Code – Current/Adopted Edition
2. ICC/ANSI A117.1 – Accessible and Usable Building and Facilities -
3. Current/Adopted Edition
4. NFPA80 –Standards For Fire Doors and Fire Windows – Current/Adopted Edition
5. NFPA101 – Life Safety Code – Current/Adopted Edition
6. NFPA105 – Installation of Smoke-Control Door Assemblies – Current/Adopted Edition.
7. ANSI - American National Standards Institute
8. BHMA – Builders Hardware Manufacturers Association
9. UL – Underwriters Laboratory
10. Texas Accessibility Standards – Current Adopted Edition
11. Local Building Codes

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.

B. Finish Hardware Schedule to be in vertical format to include:
1. Heading #/Hardware Set
2. Door #, Location, Hand, Degree of Opening, Door Size and Type, Frame Size and Type, Fire Rating
3. Quantity, type, style, function, product, product number, size, fasteners, finish and manufacturer of each hardware item.
4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
5. Keying schedule
6. Title Sheet, Index, Abbreviations, Manufacturers List, Template List and Templates.
7. Mounting locations for hardware.
8. Explanation of abbreviations, symbols, and codes contained in schedule.

C. Product Data: Provide product data in the form of a binder, manufacturer's technical product fact sheets for each item of hardware. Include whatever information may be

necessary to show compliance with requirements, including instructions for installation and for maintenance of operating parts and finish.

D. Wiring Diagrams: Provide Riser/Elevation and Point to Point Wiring Diagrams for all openings with electrified hardware. Include all information that is necessary for coordination with other trades.

E. Samples: Provide samples as requested by owner or architect with Heading # and Door# marked on boxes. All samples will be returned to the contractor and used on doors for which they were marked.

F. Templates: Provide templates of finish hardware items to each fabricator of doors, frames and other work to be factory or shop prepared for the installation of hardware.

G. Keying Schedule: After meeting with the Owner, a keying schedule shall be submitted using keyset symbols referenced in DHI manual “Keying Systems and Nomenclature." The keying schedule shall be indexed by door number, keyset, hardware heading number, cross keying instructions and special key stamping instructions.

H. Operations and maintenance data: At the completion of the job, provide to the owner two copies of an Owner’s operation and maintenance manual. The manual shall consist of a labeled hardcover three ring binder with the following technical information:
1. Title page containing: Project name, address and phone numbers. Supplier’s name, address and phone numbers.
2. Table of Contents.
3. Copy of final Finish Hardware Schedule and Keying Schedule
4. Maintenance instruction for each item of hardware.
5. Catalog pages for each product.
6. Installation Instructions and Parts List for all Locks, Exit Devices and Door Closers.

1.04 QUALITY ASSURANCES

A. Substitutions: Request for substitutions shall not be accepted within this project. Architect, owner and Hardware Consultant have selected one (1) specified and two (2) equals listed hereinafter in the Hardware Schedule. By this selection process they have established three (3) equal products for competitive pricing, while insuring no unnecessary delays by a substitution process. If any specified product is listed as a “No Substitution” product, this product will be supplied as specified, with no alteration or request of substitution. The reason for this is to comply with the uniformity established at this project. Parts and supplies are inventoried for these particular products for ease and standardization of replacement.

B. Supplier Qualifications: Supplier shall be recognized architectural finish hardware supplier, with warehousing facilities, who have been furnishing hardware in the project vicinity for a period of not less than 2 year and who is or employs a DHI Certified AHC or person with a minimum of 10 years of experience as a hardware supplier. This person shall be available at reasonable times during the course of the work for consultation about products hardware requirements, to the owner, architect and contractor.

C. Installer Qualifications (Mechanical Hardware): All finish hardware shall be installed by the finish hardware installer with a minimum of at least two (2) years documented experience. Installer shall attend a pre-installation meeting between the contractor, finish hardware suppier, hardware manufacturers representative for locks, closers and exit

devices, all door / frame suppliers. The finish hardware installer shall be responsible for the proper installation and function of all doors and hardware.

D. Installer Qualifications (Electrified Hardware): All electrified finish hardware (power, load, switch, conductor and monitoring device) shall be installed by a Electronic Access Control installer licensed by the Texas Department of Public Safety. The electrified finish hardware installer shall have a minimum of at least two (2) years of documented experience. Installer shall attend a pre-installation meeting between the contractor, finish hardware supplier, electrical contractor, fire alarm contractor, security contractor, hardware manufacturers representative for locks, closers and exit devices, all door / frame suppliers. The electrified finish hardware installer shall be responsible for the proper installation and function of all doors and hardware. Installation shall include wiring all electrified products (including the required wire to the power supply and/or junction box).

1.05 DELIVERY, STORAGE AND HANDLING

A. Marking and packaging: Mark each item or package separately, with identification related to hardware set number, door number and keyset symbol.

B. Delivery:
1. Deliver individually packaged and properly marked finish hardware at the proper time and location to avoid any delays in construction or installation.
2. At time of delivery, inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

C. Storage: Store hardware in enclosed, dry and locked area.

1.06 WARRANTY

A. All finish hardware products shall be covered by a 1 year factory warranty from the date of substantial completion of the project. Exit Devices shall carry a 3-year warranty, Mechanical Door Closers shall carry a 10-year warranty.

B. Supply warranty verification to the owner for all products that provide factory warranty.

1.07 MAINTENANCE:

A. Maintenance Service
1. None

B. Extra Materials:
1. All extra screws, fasteners, and all special installation tools furnished with the hardware shall be turned over to the owner at the completion of the job.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Screws and Fasteners:
1. All closers and exit devices provided for exterior doors, hollow metal doors, and all other required shall be provided with thru-bolts.

2. All finish hardware shall be installed to manufacturer's recommendations, using screws, attachments and installation tools provided with the hardware. No other screws or attachments are acceptable.
3. All other products to meet door and frame conditions.

B. Hinges:
1. Template: Provide templated units only.
2. Exterior: All exterior hinges shall be stainless steel base and finish.
3. Interior: All interior hinges steel based, satin chrome finish.
4. Iterior corrosive: All interior hinges at corrosive areas shall be stainless steel base and finish.
5. Exit devices: All hinges on doors with exit devices shall be heavy weight.
6. Elecctric Hinge : Provide 8 wire.
7. Provide non-removable pins for outswinging doors that are locked or are lockable.
8. All hinges on doors with door closers shall be ball bearing.
9. All hinges shall be five knuckle.
10. All hinges shall be full mortise.
11. Size: Provide 4 ½ x 4 ½ hinges on doors up to 3'0" in width. Provide 5 x 4 ½ hinges on door from 3'2" to 4'0" in width. Reference manufacturers catalog for all other sizes.
12. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.
13. The width of hinge shall be sufficient to clear all trim.
14. Supply from the following list of manufacturers:

Ives	IVE	www.ives.ingersollrand.com
Hager	HAG	www.hagerhinge.com
Bommer	BOM	www.bommer.com

C. Cylindrical Locks/Latches
1. Provide cylindrical locksets that comply with ANSI A156.2, Series 4000, Grade 1 and 2. Functions as listed in Hardware Sets.
2. Provide cylindrical locksets that meet ANSI A117.1, Accessibility Code.
3. Provide cylindrical locksets that meet UL A label; to have a minimum listing for single doors 4' x 8'
4. Levers are to be solid. Manufacturers utilizing fillers of any kind are not acceptable.
5. Latchbolt to be steel with minimum ½" throw deadlatch on keyed and exterior functions; ¾" throw anti-friction latchbolt on pairs of doors.
6. Strike to be ANSI curved lip, 1 ¼" x 4 7/8", 16 gauge, with 1" deep box construction.
7. Supply from the following list of manufacturers:

Best	BES	www.bestaccess.com	9 Series

D. Exit Devices
1. All exit device types on this project should be manufactured by the same manufacturer.
2. Exit devices are to be architectural grade touch bar type. Mechanism case to be smooth.
3. Exit devices shall meet ANSI A156.3, 1994, Grade 1. All exit devices are UL listed for Accident Hazard or Fire Exit Hardware.
4. All lever trim to match lock trim in design and finish.

5. Dogging: All non-rated devices are to be provided with dogging. Cylinder dogging as shown in hardware sets.
6. Exit devices are to be supplied and installed with thru-bolts for exterior, hollow metal doors, or as required for application.
7. Provide proper power supply for exit devices as required.
8. Push pads shall be metal, no plastic inserts allowed.
9. Exit devices shall have a flush end cap.
10. Exit devices shall be ordered with the correct strike for application.
11. Exit devices shall be order in the proper length to meet door width.
12. Exit devices shall have deadlatching.
13. Install exit devices with fastners supplied by exit device manufacturer.
14. Provide glass bead kits as required.
15. Provide proper concealed vertical rods for wood or hollow metal doors as required.
16. Supply from the following list of manufacturers:
    Von Duprin VON www.vonduprin.com 98 Series

E. Door Closers
1. All door closers on this project should be manufactured by the same manufacturer.
2. Door closers shall meet the minimum requirements of the 1990 ADA act, in lieu of ANSI Standard A156.4 and ANSI, Grade 1 on interior fire rated openings.
3. Door closers shall be furnished with standard cover. Provide full cover as shown in hardware sets.
4. Size in accordance with the manufacturers recommendations for door size and condition.
5. Door closers shall be furnished with backcheck, delayed action, hold-open and advanced backcheck as listed in the Hardware Sets.
6. Door closers shall be mounted out of the line of sight wherever possible (i.e., room side of corridor doors, etc.) with parallel arm mounting on out swinging doors.
7. Provide and mount closer top jamb or on brackets and/or drop plates, where special conditions call for it.
8. All closer installation shall include thru bolts on exterior, hollow metal doors or where required for application.
9. Supply from the following list of manufacturers
    LCN LCN www.lcnclosers.com

I. Door Protection Plates
1. Protective plates shall meet ANSI A156.6 requirements for .050 thickness.
2. Protection plates should be fabricated from stainless steel.
3. Kickplates shall be 10” by 2” less than door width on single door and 1” less than door width on pair of doors or as indicated in hardware sets. Beveled 3 edges.
4. Provide kickplate on all wood doors with closers, unless not required for aesthetic reasons.
5. Supply from the following list of manufacturers:
    Ives IVE www.ives.ingersollrand.com
    Rockwood ROC www.rockwoodmfg.com
    Trimco TRI www.trimcobbw.com

I. Door Stops and Holders:
1. Wall and Floor Stops: Supply wall stops where needed to protect doors or door hardware. When wall conditions do not permit use of wall stop provide floor stops with risers as needed to adjust for floor conditions.

2. Overhead Stops: Where wall or floors stops are not applicable provide concealed or surface overhead stops. Provide concealed in public, jury or judges area. Provide surface in all others.
3. Exterior Stops: Provide security floor stop.
4. Supply from the following list of manufacturers:

Ives	IVE	www.ives.ingersollrand.com
Glynn Johnson	GLY	www.glynn-johnson.com
Trimco	TRI	www.trimcobbw.com

J. Silencers
1. Provide silencers on all doors without seal. 3 for single doors and 2 for pairs.
2. Provide silencers as required for frame conditions. SR64 for hollow metal frames. SR65 for wood frames.
3. Supply from the following list of manufacturer's

Ives	IVE	www.ives.ingersollrand.com
Rockwood ROC		www.rockwoodmfg.com
Trimco	TRI	www.trimcobbw.com

K. Thresholds/Weatherstripping
1. All thresholds shall conform to state and local handicap codes.
2. Smoke seal shall be teardrop design bulb seal.
3. Exterior seal/thresholds shall be silicone or brush as shown in hardware sets.
4. Sound seal shall be neoprene.
5. Drip strips shall protrude 2 ½".
6. Provide door sweeps.
7. Provide UL meeting stile gasketing for fire rated doors.
8. Supply from the following list of manufacturer's

National Guard		NGP	www.ngpinc.com
Hager Hinge Company	HAG	www.hagerhinge.com	
Pemko		PEM	www.pemko.com
Zero		ZER	

2.03 KEYING:

A. General: Finish Hardware Supplier shall meet in person with owner to finalize keying requirements and match existing or start a new Best Master Key System for the project.

B. Cylinders: All cylinder/cores on this project should be manufactured and providing in the same keyway.

C. Cylinders: Provide the correct and quantity of cylinders for all applications.

D. Keys: Provide nickel silver keys only. Furnish 2 change keys for each lock: 5 control keys: 5 master keys for each master system and 5 grandmaster keys for each grandmaster key system. Deliver all keys to owners' representative.

E. Cores and keys shall be provided with identification stamping.

F. Provide construction keying / construction cores for this project with constructions keys.

PART 3 – EXECUTION:

3.01 EXAMINATION:

A. Examine doors, frames and related items for conditions that would prevent the proper application of any finish hardware items. Do not proceed with installation until all defects are corrected.

3.02 INSTALLATION:

A. Follow Door and Hardware Institute Publication for:
Recommended Location for Architectural Hardware for Standard Steel Doors and Frames
Recommended Location for Builder's Hardware for Custom Steel Doors and Frames
Recommended Locations for Architectural Hardware for Wood Flush Door

B. Follow ANSI A117.1-1998 Accessible and Usable Building and Facilities

C. Review mounting locations with Architect.

D. Pre Installation meeting required with attendees to include Architect, Contractor, Mechanical Hardware and Electrified Hardware Installer, Finish Hardware Supplier and Manufacturer's Representative for Exit Device, Locks and Closers before installation begins.

3.03 FIELD QUALITY CONTROL:

A. After installation has been completed, obtain the services of an Architectural Hardware Consultant to check for proper installation of finish hardware, according to the finish hardware schedule and keying schedule. In addition, check all hardware for adjustments and proper operation.

3.04 ADJUST AND CLEAN:

A. Adjust, clean and inspect all hardware, to ensure proper operation and function of every opening. Replace items, which cannot be adjusted to operate freely and smoothly as intended for the application made.

3.05 PROTECTION:

A. The general contractor shall use all means at his disposal to protect all finish hardware items from abuse, corrosion and other damage until the owner accepts the project as complete.

3.07 TRAINING

A. After installation has been completed, provide training to the Owner on the operation of finish hardware and programming of any access control items.

3.06 HARDWARE SCHEDULE

A. These hardware set shown below are for use as a guideline. Provide hardware as required to meet the requirements of the openings, security, and code requirements.

HARDWARE GROUP NO. 704

FOR USE ON MARK/DOOR #(S):
200

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	MFR
2	EA	CONT. HINGE	112HD	IVE
1	EA	PANIC HARDWARE	LD-9847-EO-WH	VON
1	EA	PANIC HARDWARE	LD-9847-NL-WH	VON
1	EA	RIM CYLINDER	12E 7	BES
2	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	LCN
2	EA	PROTECTION PLATE	8400 10" X 1" LDW B-CS	IVE
1	EA	RAIN DRIP	142A DW + 4"	ZER
2	EA	SILENCER	SR64	IVE

HARDWARE GROUP NO. C201

FOR USE ON MARK/DOOR #(S):
102

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	IVE
1	EA	POWER TRANSFER	EPT10	VON
1	EA	ELECTRICALLY UNLOCKED LOCK WITH RQE	9KW 2 7 DEU 14 D RQE	BST
1	EA	SURFACE CLOSER	4040XP RW/PA X MTG BRKT, SPCR & PLATE AS REQ	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	WALL STOP	WS406/407CCV	IVE
1	EA	GASKETING	188S H & J (USE SILENCERS @ NON-RATED DOORS)	ZER
3	EA	SILENCER	SR64	IVE

HARDWARE GROUP NO. C205

FOR USE ON MARK/DOOR #(S):
101

EACH TO HAVE:

QTY	DESCRIPTION	CATALOG NUMBER	MFR

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	EA	POWER TRANSFER	EPT10	VON
1	EA	ELECTRICALLY UNLOCKED LOCK WITH RQE	9KW 2 7 DEU 14 D RQE	BST
1	EA	SURFACE CLOSER	4040XP SCUSH X MTG BRKT, SPCR & PLATE AS REQ	LCN
1	EA	PROTECTION PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	RAIN DRIP	142A DW + 4"	ZER
1	EA	GASKETING	328AA-S	ZER
1	EA	GASKETING	429AA-S	ZER
1	EA	DOOR SWEEP	39A	ZER
1	EA	THRESHOLD	655A-223	ZER

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

1.5 HANDLING

A. Delivery: Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store off ground, either in a dry, ventilated, enclosed space or protected with suitable waterproof coverings.

C. Handling: Protect non-structural framing members from rusting and damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

C. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.

D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: 2-1/2 inches (64 mm).

E. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
   2. Steel Studs and Tracks: ASTM C 645.
      a. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).
      b. Depth: 1-5/8 inches (41 mm).
   3. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
      a. Configuration: hat shaped.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Hangers: 48 inches (1219 mm) o.c.
   2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
   3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not attach hangers to steel roof deck.
   6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockups for the following:
      a. Each level of gypsum board finish indicated for use in exposed locations.
   2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
   3. Simulate finished lighting conditions for review of mockups.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. American Gypsum; 5/8- inch FireBloc Type X Gypsum Wallboard.
      b. CertainTeed Corporation; Type X Gypsum Board.
      c. Continental Building Products, LLC; Firecheck Type X.
      d. Georgia-Pacific Building Products; ToughRock Fireguard X Gypsum Board.
      e. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board.
      f. United States Gypsum Company; USG Sheetrock Brand Firecode X Gypsum Panels.
   2. Thickness: 5/8 inch (15.9 mm).
   3. Long Edges: Tapered.

2.4 SPECIALTY GYPSUM BOARD

A. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Continental Building Products, LLC; Weather Defense Platinum Interior Type X.
      b. Georgia-Pacific Building Products; DensArmour Plus.
      c. National Gypsum Company; eXP Interior Extreme.
      d. United States Gypsum Company; USG Sheetrock Brand Glass-Mat Panels Mold Tough .
   2. Core: 5/8 inch (15.9 mm), Type X.
   3. Long Edges: Tapered.
   4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

C. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

D. Form control and expansion joints with space between edges of adjoining gypsum panels.

E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: Vertical surfaces unless otherwise indicated.
2. Glass-Mat Interior Type: As indicated on Drawings.
a. Interior side of exterior walls.

B. Single-Layer Application:
1. On partitions/walls, apply gypsum panels vertically (parallel to framing) ,unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use where indicated.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies. Level 1 finish shall be applied at ceiling plenum areas, concealed areas.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges. Level 2 finish shall be applied to glass-mat interior gypsum board, where panels are substrate for tile, and other locations where indicated.
3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges. Joint compound shall be smooth and free from tool marks and ridges. Level 3 finish shall be applied to panels in Mechanical Rooms, Electrical Rooms, and similar spaces.
4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges. Joint compound shall be smooth and free from tool marks and ridges. Level 4 finish shall be applied to panels in all locations except where another level of finish is specified.
   a. Primer and its application to surfaces are specified in other Section 09 91 23 "Interior Painting."
5. Level 5: Not used

D. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
   1. Acoustical Panels: Samples of each type, color, pattern, and texture in manufacturer's standard sample size, minimum 6 inches square.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- (150-mm-) long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling 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. Ceiling suspension-system members.
   2. Structural members to which suspension systems will be attached.
   3. Method of attaching hangers to building structure.
   4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
   5. Size and location of initial access modules for acoustical panels.
   6. Items penetrating finished ceiling and ceiling-mounted items including the following:
      a. Lighting fixtures.
      b. Diffusers.
      c. Grilles.
      d. Speakers.
      e. Sprinklers.
      f. Perimeter moldings.
   7. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48) .

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size panels equal to 5 percent of quantity installed.
   2. Suspension-System Components: Quantity of each exposed component equal to 5 percent of quantity installed.
   3. Hold-Down Clips: Equal to 5 percent of quantity installed.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Build mockup of typical ceiling area as directed by Architect.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E 1264.
   2. Smoke-Developed Index:450 or less.

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL PANELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corp.
   3. Rockfon (Roxul, Inc.)
   4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Panels: As Scheduled

2.4 METAL SUSPENSION SYSTEM

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. Armstrong World Industries, Inc.
   2. CertainTeed Corp.
   3. Chicago Metallic Corporation.
   4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Basis-of-Design Product: As scheduled.

C. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
   1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.

D. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
   1. Structural Classification: Intermediate-duty system.
   2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
   3. Face Design: Flat, flush.
   4. Cap Material: Cold-rolled steel or aluminum.
   5. Cap Finish: Painted white.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- (2.69-mm-) diameter wire.

C. Hold-Down Clips: Manufacturer's standard hold-down.

2.6 METAL EDGE MOLDINGS AND TRIM

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. Armstrong World Industries, Inc.
2. CertainTeed Corporation.
3. Chicago Metallic Corporation.
4. Fry Reglet Corporation.
5. Gordon, Inc.
6. United States Gypsum Company.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counters playing, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   7. Do not attach hangers to steel deck tabs.
   8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
   10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
   3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
   3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   4. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
      a. Hold-Down Clips: Space 24 inches (610 mm) o.c. on all cross runners.
   5. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 69 00

ACCESS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cementitious-core steel panel access flooring.

1.2 COORDINATION

A. Coordinate location of mechanical and electrical work in underfloor cavity to prevent interference with access flooring.

B. Mark pedestal locations on subfloor to enable mechanical and electrical work to proceed without interfering with access-flooring pedestals installed after mechanical and electrical work.

1.3 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 access flooring.
   2. Include loading capacities.

B. Shop Drawings: For access flooring:
   1. Include layout of access flooring and relationship to adjoining Work based on field-verified dimensions.
   2. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, and understructures.

C. Samples for Verification: For the following products:
   1. Exposed Metal Accessories: Approximately 10 inches (250 mm) in length.
   2. One full-size floor panel, pedestal, and understructure unit for each type of access flooring required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of access flooring.

C. Product Test Reports: For each type of access-flooring material and floor covering, performed by a qualified testing agency.

1.5 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. Panels: 10 percent.
   2. Gratings: 10 percent.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Build mockup of typical access flooring, as shown on Drawings. Size to be an area no fewer than five floor panels in length by five floor panels in width.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install access flooring until spaces are enclosed, ambient temperature is between 50 and 90 deg F (10 and 32 deg C), and relative humidity is not less than 20 and not more than 70 percent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide access flooring capable of complying with the following performance requirements according to testing procedures in CISCA's "Recommended Test Procedures for Access Floors":
   1. Concentrated Loads: 1000 lbf (4448 N) with the following deflection and permanent set:
      a. Top-Surface Deflection: 0.10 inch (2.54 mm).
      b. Permanent Set: 0.010 inch (0.25 mm).
   2. Ultimate Loads: 2000 lbf (8896 N).
   3. Rolling Loads: With local or overall deformation not to exceed 0.040 inch (1.02 mm).
      a. CISCA Wheel 1: 10 passes at 400 lbf (1779 N).
      b. CISCA Wheel 2: 10,000 passes at 400 lbf (1779 N).
   4. Stringer Load Test: 225 lbf (1001 N) at center of span with a permanent set not to exceed 0.010 inch (0.254 mm).
   5. Pedestal Axial Load Test: 5000 lbf (22 240 N).
   6. Drop Impact Load Test: 75 lb (34.0 kg).

B. Fire Performance:
   1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 50 or less.

2.2 CEMENTITIOUS-CORE STEEL PANEL ACCESS FLOORING

A. Fabricate panels from cold-rolled steel sheet, with die-cut flat top sheet and die-formed and stiffened bottom pan welded together. Protect metal surfaces against corrosion using manufacturer's standard factory-applied finish. Fully grout internal spaces of completed units with manufacturer's standard cementitious fill.
   1. Manufacturers: Subject to compliance with requirements,:
      a. Global IFS.

b. Haworth, Inc.
c. RAF.
d. Tate Access Floors, Inc.

2. Basis-of-Design Product: Haworth; Raised Access Flooring.
3. Configuration: Provide modular panels with nominal size of 24 by 24 inches (610 by 610 mm), interchangeable with other field panels without disturbing adjacent panels or understructure.
4. Attachment to Understructure: Bolted.

B. Grates: Grating ribs arranged in manufacturer's standard pattern to produce a nominal open area of 56 percent. Provide mechanical dampers with each panel unit.
1. Quantity: As shown on Drawings.
2. Finish: Manufacturer's standard.

C. Pedestal System Understructure: System consisting of base, column with provisions for height adjustment, and head (cap); made of steel.
1. Base: Square or circular base with not less than 16 sq. in. (103 sq. cm) of bearing area.
2. Column: Of height required to bring finished floor to elevations indicated. Weld column to base plate.
3. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 2 inches (51 mm) and for locking at a selected height, so deliberate action is required to change height setting and prevent vibratory displacement.
4. Head: Designed to support the floor panel indicated.
a. Provide sound-deadening pads or gaskets at contact points between heads and panels.
b. Bolted Assemblies: Provide head with four holes aligned with holes in floor panels for bolting of panels to pedestals.

D. Stringer System Understructure: Modular steel stringer systems designed to bolt to pedestal heads and form a grid pattern. Protect steel components with manufacturer's standard galvanized or corrosion-resistant paint finish.
1. Continuous Gaskets: At contact surfaces between panel and stringers to deaden sound, seal off the underfloor cavity from above, and maintain panel alignment and position.

E. Floor Finish: Provide factory-applied floor finish fabricated in one piece to cover entire panel face; with integral trim edging.
1. Static-Dissipative Vinyl Tile: ASTM F 1700, Class I (Monolithic Vinyl Tile), Type A (Smooth Surface).
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) Flexco.
2) VPI Corporation.
b. Electrical Resistance: Average no less than 1 megohm and no more than 1000 megohms when installed floor coverings are surface-to-ground tested according to ASTM F 150 with 100-V applied voltage.
c. Colors, Textures, and Patterns: As scheduled.

2.3 FABRICATION

A. Fabrication Tolerances:
1. Size: Plus or minus 0.020 inch (0.50 mm) of required size.

2. Squareness: Plus or minus 0.015 inch (0.38 mm) between diagonal measurements across top of panel.
3. Flatness: Plus or minus 0.035 inch (0.89 mm), measured on a diagonal on top of panel.

B. Panel Markings: Clearly and permanently mark floor panels on their underside with panel type and concentrated-load rating.

C. Bolted Panels: Provide panels with holes drilled in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.
1. Captive Fasteners: Provide fasteners held captive to panels.

D. Cutouts: Fabricate cutouts in floor panels for cable penetrations and service outlets. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with structural performance requirements.
1. Number, Size, Shape, and Location: As indicated.
2. Grommets: Where indicated, fit cutouts with manufacturer's standard grommets; or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding with tapered top flange. Furnish removable covers for grommets.
3. Provide foam-rubber pads for sealing annular space formed in cutouts by cables.

2.4 ACCESSORIES

A. Adhesives: Manufacturer's standard adhesive for bonding pedestal bases to subfloor.

B. Panel Lifting Device: Panel manufacturer's standard portable lifting device for each type of panel required for each computer room.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's authorized representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of conditions and deleterious substances that might interfere with attachment of pedestals.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than 6 inches (152 mm).

B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

3.3 INSTALLATION

A. Install access flooring and accessories under supervision of access-flooring manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.

B. Adhesive Attachment of Pedestals: Set pedestals in adhesive, according to access-flooring manufacturer's written instructions, to provide full bearing of pedestal base on subfloor.

C. Adjust pedestals so installed panels are flat, level, and at the proper height.

D. Stringer Systems: Secure stringers to pedestal heads according to access-flooring manufacturer's written instructions.

E. Install flooring panels securely in place, leaving them properly seated with panel edges flush. Do not force panels into place.

F. Scribe perimeter panels to provide a close fit, with adjoining construction having no voids greater than 1/8 inch (3 mm) where panels abut vertical surfaces.
   1. To prevent dusting, seal cut edges of steel-encapsulated, wood-core panels with sealer recommended in writing by panel manufacturer.

G. Cut and trim access flooring and perform other dirt-or-debris-producing activities at a remote location or as required to prevent contamination of subfloor under installed access flooring.

H. Grounded Access Flooring: Ground access flooring as recommended by manufacturer and as needed to comply with performance requirements for electrical resistance of floor coverings.
   1. Panel-to-Understructure Resistance: Not more than 10 ohms as measured without floor coverings.

I. Clean dust, dirt, and construction debris caused by floor installation, and vacuum subfloor area as installation of floor panels proceeds.

J. Install access flooring without change in elevation between adjacent panels and within the following tolerances:
   1. Plus or minus 1/16 inch (1.5 mm) in any 10-foot (3-m) distance.
   2. Plus or minus 1/8 inch (3 mm) from a level plane over entire access flooring area.

3.4 PROTECTION

A. Prohibit traffic on access flooring for 24 hours and removal of floor panels for 72 hours after installation, to allow pedestal adhesive to set.

B. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

END OF SECTION

SECTION 09 91 13

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Indicate VOC content.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As scheduled.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
   3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
   4. Paint entire exposed surface of window frames and sashes.
   5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed to view:
      a. Equipment, including panelboards and switch gear.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Ferrous Metal, Semigloss, Exterior Acrylic-Enamel Finish: Primer is not required on shop-primed items; touch up shop primer where provided.
   1. PPG:
      a. First Coat: Primer 4020 Pitt-Tech Plus Int./Ext. Primer DTM, 2.5 mils DFT.
      b. Finish Coat: 4216 Pitt-Tech Plus Int./Ext. Semi-Gloss DTM, 2.5 mils DFT.
   2. Sherwin-Williams:
      a. Primer: Pro Industrial Pro-Cryl Universal Primer, B66-310 Series 2.0 - 4.0 mils DFT.
      b. Second Coat: Pro Industrial Acrylic Semi-Gloss, B66-650 Series 2.5 mils DFT.

B. Zinc-Coated (Galvanized) Metal, Semigloss, Exterior Acrylic-Enamel Finish:
   1. PPG:
      a. Primer: 4020 Pitt-Tech Int./Ext. Primer/Finish DTM, 2.5 mils DFT.
      b. Second Coat: 4216 Pitt-Tech Plus Int./Ext. Semi-Gloss DTM, 2.5 mils DFT
      c. Third Coat: Same as second coat.
   2. Sherwin-Williams:
      a. Primer: Pro Industrial Pro-Cryl Universal Primer, B66-310 Series 2.0 - 4.0 mils DFT.
      b. Second Coat: Pro Industrial Acrylic Semi-Gloss, B66-650 Series 2.5 mils DFT.
      c. Third Coat: Same as second.

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Indicate VOC content.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations and VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As scheduled.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Masonry (CMUs): 12 percent.
   2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in equipment rooms:
      a. Uninsulated metal piping.
      b. Uninsulated plastic piping.
      c. Pipe hangers and supports.
      d. Metal conduit.
      e. Plastic conduit.
      f. Tanks that do not have factory-applied final finishes.
      g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

   2. Paint the following work where exposed in occupied spaces:
      a. Equipment, including panelboards.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.

e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

F. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:
   a. Architectural woodwork and casework.
   b. Metal lockers.
   c. Finished mechanical and electrical equipment.
   d. Light fixtures.
   e. Panelboards and switch gear.
2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
   a. Furred areas.
   b. Ceiling plenums.
   c. Pipe spaces.
   d. Duct shafts.
3. Finished metal surfaces include the following:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper.
   e. Bronze and brass.

G. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Rated Wall Assemblies Identification:

1. Identify fire-rated wall assemblies with stenciled lettering on wall surface above ceiling line.
2. Provide stenciled block letters in red to identify each rated wall assembly.

3.4 FIELD QUALITY CONTROL

A. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

B. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board, Semi-Gloss, Epoxy, Low VOC: 2 finish coats over a primer.
   1. PPG:
      a. Primer: 6-2 Speedhide Interior Latex Sealer.1.4 mils DFT.
      b. Second Coat: Pitt-Glaze WB1 Pre-Catalyzed Acrylic Epoxy Semigloss, 16-510 Series, 2.7 mils DFT.
      c. Third Coat: Same as second coat.
   2. Sherwin-Williams:
      a. Primer: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
      b. Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-150 Series, 1.5 mils DFT.
      c. Third Coat: Same as second coat.

B. Ferrous Metal, Epoxy, Semi-Gloss, Low VOC: 2 finish coats over a primer. Wherever wall surfaces are scheduled to receive epoxy paint, paint doors and frames within the wall with epoxy.
   1. PPG:
      a. Primer: 4020 Pitt Tech Plus Acrylic Primer/finish DTM Industrial, 3.0 mils DFT.
      b. Second Coat: Pitt-Glaze WB1 Pre-Catalyzed Acrylic Epoxy Semigloss, 16-510, 3.0 mils DFT.
      c. Third coat: Same as second coat.

2. Sherwin-Williams:
   a. Primer: Pro Industrial Pro-Cryl Universal Primer, B66-310 Series 2.0 - 4.0 mils DFT.
   b. Second Coat: Water Based Catalyzed Epoxy, B70-200 Series, 3.0 mils DFT.
   c. Third Coat: Same as second coat.

C. Concrete Masonry Units, Epoxy, Semi-Gloss:
1. PPG:
   a. Primer: 6-15XI Speedhide Hi Fill Int/Ext Acrylic Block Filler, 8-12.0 mils DFT.
   b. Second Coat: Amerlock 2VOC High Solids Epoxy, 4-7 mils DFT.
   c. Third Coat: Same as second coat.
2. Sherwin-Williams:
   a. Primer: PrepRite Block Filler, B25W25 8 mils DFT
   b. Second Coat: SW Dura-Plate 235 Multi-Purpose Epoxy, B67-235 Series 5 mils.
   c. Third Coat: Same as second coat.

D. Plaster, Acrylic Latex:
1. Sherwin-Williams:
   a. Primer: ProMar 200 Zero VOC Primer B28W2600
   b. Second Coat: Sherwin-Williams ProMar 200 Zero VOC.
   c. Third Coat: Same as second coat.

E. Steel, Water-Based Acrylic Dry Fall:
1. Sherwin-Williams:
   a. Primer: Pro-cryl Universal Primer B66-310 Series.
   b. Second Coat: Sherwin-Williams Low VOC Waterborne Acrylic Dryfall B42W81.
   c. Third Coat: Same as second coat.

END OF SECTION

SECTION 10 44 13

FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-protection cabinets for the following:
      a. Portable fire extinguisher.

1.2 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to fire-protection cabinets, including, but not limited to, the following:
      a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets.
   1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches (150 by 150 mm) square.

D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Babcock-Davis.
   2. JL Industries, Inc.; a division of the Activar Construction Products Group.
   3. Larsens Manufacturing Company.
   4. Nystrom, Inc.
   5. Potter Roemer LLC.
   6. Strike First Corporation of America (The).
   7. Guardian Fire Equipment, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.3 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Basis-of Design Product: Guardian Fire Equipment, Inc.; Model 1820.

B. Cabinet Construction: Nonrated and rated to match wall rating.
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- (1.09-mm-) thick cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
   1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Stainless-steel sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Tempered float glass (clear).

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide projecting lever handle with cam-action latch.
   2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
   3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
        1) Location: Applied to cabinet door.
        2) Application Process: Pressure-sensitive vinyl letters.
        3) Lettering Color: Red.
        4) Orientation: Vertical.

K. Materials:
1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
    a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Color: As selected by Architect from manufacturer's full range.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.
5. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum ½-inch- (13 mm-) thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations 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.
   1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
   2. Provide inside latch and lock for break-glass panels.
   3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification:
   1. Apply vinyl lettering at locations indicated.

3.4 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 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Babcock-Davis.
      b. Amerex Corporation.
      c. Brooks Equipment Co., Inc.
      d. Buckeye Fire Equipment Co.
      e. Fire-End & Croker Corporation.
   2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
   3. Valves: Manufacturer's standard.
   4. Handles and Levers: Manufacturer's standard.
   5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Carbon Dioxide Type: UL-rated 10-B:C, 10-lb (4.5-kg) nominal capacity, with carbon dioxide in manufacturer's standard enameled-metal container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
   1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
      a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: Top of fire extinguisher to be at height to meet requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

18465.01

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

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 CHECKING DOCUMENTS:

A. The drawings and the specifications are numbered consecutively. The Contractor shall check the drawings and specifications thoroughly and shall notify the Architect of any discrepancies or omissions of sheets or pages. Upon notification, the Architect will promptly provide the Contractor with any missing portions of the drawings or specifications. No discrepancies or omissions of sheets or pages of the contract documents will relieve the Contractor of his duty to provide all work required by the complete contract documents.

1.3 SUMMARY

A. This Section includes the following:
1. General Provisions for Construction
2. Piping materials and installation instructions common to most piping systems.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Equipment installation requirements common to equipment sections.
8. Painting and finishing.
9. Concrete bases.
10. Supports and anchorages.
11. Close-out Documents and Requirements

1.4 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install," "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" always refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

G. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

H. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

I. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

J. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

K. 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.

L. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.5 GENERAL:

A. In general, the lines to be installed under these specifications shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards as to complete the work in a neat and satisfactorily workable manner. The following is a general outline concerning the running of various lines and ducts and is to be excepted where the drawings or conditions at the building necessitate deviating from these standards.

B. All piping shall be concealed in chases in finished areas, except as indicated on the drawings. Horizontal lines run in areas that have ceilings shall be run concealed in those ceilings, unless otherwise specifically indicated or directed.

C. Piping may be run exposed in machinery and equipment spaces, where serving as connections to equipment items in finished rooms where exposed connections are required, and elsewhere as indicated on the drawings or required.

D. The Contractor shall thoroughly acquaint himself with the details of the construction and finishes before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details. Place all inserts in masonry walls while they are under construction. All concealed lines shall be installed as required by the pace of the general construction to precede that general construction.

E. The Contractor shall carefully lay out his work at the site to conform to the architectural and structural conditions, to provide proper grading of lines, to avoid all obstruction, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation.

F. The mechanical and electrical plans do not give exact locations of outlets, fixtures, equipment items, etc. The exact location of each item shall be determined by reference to the general

plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with other sections. Minor relocations necessitated by the conditions at the site or as directed by the Architect shall be made without any additional cost accruing to the Owner.

G. The Contractor shall be responsible for the proper fitting of his material and apparatus into the space. Should the particular equipment which any bidder proposes to install require other space conditions than those indicated on the drawings, he shall arrange for such space with the Architect before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such necessary changes at his (the Contractor's) own expense.

H. Order of precedence shall be observed in laying out the pipe, ductwork, material, and conduit in order to fit the material into the space above the ceiling and in the chases and walls. The following order shall govern:
1. Items affecting the visual appearance of the inside of the building such as lighting fixtures, diffusers, grilles, outlets, panelboards, etc. Coordinate all items to avoid conflicts at the site.
2. Lines requiring grade to function such as sewers.
3. Large ducts and pipes with critical clearances.
4. Conduit, water lines, and other lines whose routing is not critical and whose function would not be impaired by bends and offsets.

I. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention before the contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus, material, or equipment.

J. The Contractor shall distinctly understand that the work described herein and shown on the accompanying drawings shall result in a finished and working job, and any item required to accomplish this intent shall be included whether specifically mentioned or not.

K. Each bidder shall examine the plans and specifications for the General Construction. If these documents show any item requiring work under Division 21 and that work is not indicated on the respective fire protection or plumbing drawings, he shall notify the Architect in sufficient time to clarify before bidding. If no notification is received, the Contractor is assumed to require no clarification, and shall install the work as indicated on the General Plans in accordance with the specifications.

1.6 DIMENSIONS:

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings. Any difference which may be found shall be submitted to the Architect for consideration before proceeding with the work.

1.7 INSPECTION OF SITE:

A. The accompanying plans do not indicate completely the existing installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not

constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.8 SUBMITTALS

A. Wherever shop drawings are called for in these specifications, they shall be furnished by the Contractor for the work involved after review by the Architect as to the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary details. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary and should there be any charges in connection with this, they shall be borne by the Contractor.

B. Shop drawings will be reviewed by the Architect for general compliance with the design concept of the project and general compliance with the information given in the contract documents. Review by the Architect and any action by the Architect in marking shop drawings is subject to the requirements of the entire contract documents. Contractor will be held responsible for quantities, dimensions which shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of all trades and the satisfactory performance of his work.

C. Shop drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission of individual items shall designate the exact item offered and shall clearly identify the item with the project.

D. All shop drawings shall be submitted at one time and shall consist of a bound catalogue of all shop drawings under each section, properly indexed and certified that they have been checked by the Contractor.

E. The omissions of any material from the shop drawings which has been shown on the contract drawings or specified, even though reviewed by the Architect, shall not relieve the Contractor from furnishing and erecting same.

F. Product Data: For the following:
   1. Mechanical sleeve seals.
   2. Escutcheons.
   3. Material indicated in other Division 21 Sections.

G. Welding certificates.

1.9 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 Fire-Suppression 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. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.10 LAWS, CODES AND ORDINANCES:

A. All work shall be executed in strict accordance with all local, state and national codes, ordinances and regulations governing the particular class of work involved, as interpreted by the inspecting authority. The Contractor shall be responsible for the final execution of the work under this heading to suit those requirements. Where these specifications and the accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect, shall prepare any supplemental drawings required illustrating how the work may be installed so as to comply and, on approval, make the changes at no cost to the Owner. On completion of the various portions of the work the installation shall be tested by the constituted authorities, approved and, on completion of the work, the Contractor shall obtain and deliver to the Owner a final certificate of acceptance.

1.11 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. Refer to other Division 21 Sections for additional requirements.

1.12 GUARANTEE:

A. Unless a longer guarantee is hereinafter called for, all work, material and equipment items shall be guaranteed for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect, shall be repaired and/or replaced to the complete satisfaction of the Architect. Guarantee shall be in writing and in triplicate.

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.
      a. Where a definite material is mentioned in these specifications, it has been done in order to establish a standard. The product of the particular manufacturer mentioned is of satisfactory construction and any substitution must be of quality as good as or better than the named article. No substitution shall be made without review by the Architect, who will be the sole judge of equality.
      b. Should a substitution be accepted under the provisions of the conditions of these specifications, and should this substitute prove to be defective or otherwise unsatisfactory for the service for which it is intended within the guarantee period,

the Contractor who originally requested the substitution shall replace the substitute material with the specified material.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 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 21 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. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. 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.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 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: Plastic. 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.

2.5 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.

2.6 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 and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
1. Finish: Polished chrome-plated and rough brass.

E. One-Piece, Floor-Plate Type: Cast-iron floor plate.

F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.7 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 ACCESS PANELS:

A. Wherever valves or other components are installed and access is required through either walls or ceilings and such cannot be obtained through the removable ceiling or through other means, the Contractor shall provide Milcor Style "M" access doors at least 12 inches by 12 inches in size or larger if required for access. Provide rated access panels as required for installation in rated construction.

3.2 USE OF SYSTEM:

A. In general, the fire suppression systems shall be installed in a timely manner, at a pace consistent with the general construction, but shall then be made operational as soon as practicable to provide protection during the remainder of construction. Where underground service lines and hydrants are included in the project, they shall be installed, completed, and placed in service prior to construction work. Water service lines shall be extended to the building and made available prior to the delivery of any combustible building materials.

B. The use of the equipment and system for providing building fire protection shall in no way constitute acceptance of that equipment and the connected piping by the Owner. Furthermore, it shall in no way shorten the guarantee period hereinafter specified. The Contractor shall either secure extended warranties from the vendors of equipment or shall purchase insurance to provide proper coverage on the equipment through the guarantee period and shall file with the Architect substantiating affidavits from equipment manufacturers or a copy of the insurance policy covering the equipment through the guarantee period. The personal underwriting of the Contractor for equipment manufacturers' warranties is not acceptable, but his personal underwriting of piping, ductwork, insulation and associated materials is acceptable subject to the provisions of the contract.

3.3 OWNERS OCCUPANCY:

A. It shall be understood that the building in which the work is to be done is a necessary part of the Owner's operation, and shall continue in use throughout the construction period without interruption. Take all precautions required by the Owner for the protection of his equipment and property.

B. Contractor shall cooperate with the owner in scheduling areas in which work is permitted. Owners schedule will govern.

3.4 SCHEDULE OF WORK:

A. The Contractor shall program his work in such manner as to interfere as little as possible with the normal routine of the Owner. It must be understood that the Owner will continue to function throughout the construction period. All water and sanitary facilities shall therefore be continued in operation with a minimum of interruption and the Contractor shall make any temporary connections necessary to comply with this requirement.

B. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to insure meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates, schedule the times of work in the various areas involved, etc. Each Contractor shall cooperate in establishing these times and locations and shall process his work so as to insure the proper execution of it.

C. Under no condition shall any work be done in the present building that would interfere with its natural use during its normal hours of occupancy, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to present lines or items of equipment in that building or where present equipment items in that building are to be relocated or modified in any way. The Contractor shall include this scheduling requirement in his proposal as no additional compensation for overtime work will be granted.

3.5 WORKING TIME:

A. Where new connections are to be made into existing lines, present lines must be relocated or rerouted, present equipment items relocated or other work accomplished that would affect the operation of the present building, the work shall be carried on at such times as to cause a minimum of interference with the normal operation of that building. In certain cases the work may be accomplished during normal working hours during certain designated seasons or times of the year. In other cases the work may have to be executed during times of the day outside of the normal working period, on holidays, etc. Each individual case presents a separate decision as to the time during which it shall be performed. The Contractor involved shall present each case to the Architect for his decision, which will be made after due consultation with the Owner. No additional compensation for overtime will be granted for compliance with these requirements.

3.6 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 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. Fire sprinkler piping shall not be supported with hangers of other trades, and in no way shall be used to support the work of other trades. Hangers for fire sprinkler piping shall be independent of all other supports.

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. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
f. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
g. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. 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-inchannular 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 07 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, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

N. 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.

O. 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.

P. 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 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.7 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 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 Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

3.8 ELECTRICAL WIRING:

A. All electric wiring of every character, shall be done under Divisions 26 and 27 of these specifications. The Contractor for each section shall erect all his motors in place ready for connections. The Contractor, under Division 26, shall mount all the starters and controls, furnishing the supporting structures and any required outlet boxes.

B. Every electrical current consuming device furnished as a part of this project, or furnished by the Owner and installed in this project, shall be completely wired up under Divisions 26 and 27. Verification of exact location, method of connection, number and size of wires required, voltage requirements, and phase requirements is the responsibility of the Contractor under Divisions 26 and 27. If conflicts occur between the drawings and the actual requirements, actual requirements shall govern.

3.9 SEALING AROUND PIPES

A. The Contractor installing pipes shall seal all spaces between pipes and/or sleeves where they pierce walls, partitions or floors with Johns-Manville Firetemp CI intumescent caulk or as directed by architect. The packing shall effect a complete fire and/or air seal where pipes, ducts, etc., pierce walls, floors or partitions.

3.10 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 equipment to facilitate service, maintenance, and repair or replacement of components. 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.

3.11 PROGRESS OF WORK:

A. The Contractor shall keep himself fully informed as to the progress of the work and do his work at the proper time without waiting for notification from the Architect or Owner.

3.12 COORDINATION

A. The Contractor shall be responsible for resolving all coordination required between trades. For example, items furnished under Division 21 which require electrical connections shall be coordinated with Divisions 26 or 27 for:
1. Voltage
2. Phase
3. Ampacity
4. No. and size of wires
5. Wiring diagrams
6. Starter size, details and location
7. Control devices and details

B. Items installed in/on finished ceilings shall be coordinated with the ceiling construction. The Contractor under each section shall conform to the reflected ceiling plan and shall secure details and/or samples of the ceiling materials as necessary to insure compatibility. Any device not conforming to this requirement shall be replaced by the Contractor at his expense.

C. All items specified under Division 21 shall be installed tight, plumb, level, square and symmetrically placed in relation to the work of other trades.

D. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire sprinkler installations.

E. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

3.13 MANUFACTURER'S DIRECTIONS:

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer.

3.14 MATERIALS AND WORKMANSHIP:

A. All materials shall be new unless otherwise specified and of the quality specified. Materials shall be free from defects. All materials of a type for which the Underwriters Laboratories, Inc. have established a standard shall be listed by the Underwriters Laboratories, Inc. and shall bear their label.

B. Wherever the make of material or apparatus required is not definitely specified, the Contractor shall submit a sample to the Architect before proceeding.

C. The Architect reserves the right to call for samples of any item of material offered in substitution, together with a sample of the specified material, when, in the Architect's opinion, the quality of the material and/or the appearance is involved and it is deemed that an evaluation of the two materials may be better made by visual inspection. This shall be limited to plumbing brass, grilles, registers, ceiling outlets and similar items and shall not be applicable to major manufacturers' items of equipment.

D. The Contractor shall be responsible for transportation of his materials to and on the job, and shall be responsible for the storage and protection of these materials and work until the final acceptance of the job.

E. The Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.

F. The workmanship shall in all respects be of the highest grade and all construction shall be done according to the best practice of the trade.

3.15 COOPERATION AND CLEANING UP:

A. The contractor for the work under each section of these specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

3.16 TESTING:

A. The Contractor under each division shall at his own expense perform the various tests as specified and required by the Architect and as required by the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests. Notify the Architect a minimum of 24 hours in advance of all tests.

3.17 PAINTING

A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.18 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.
   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 03.

3.19 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression 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.

3.20 GROUTING

A. Mix and install grout for fire-suppression 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.

3.21 INSTALLATION DRAWINGS:

A. It shall be incumbent upon the Contractor to prepare special drawings as called for elsewhere herein or as directed by the Architect to coordinate the work under each section, to illustrate changes in his work, to facilitate its concealment in finished spaces to avoid obstructions or to illustrate the adaptability of any item of equipment which he proposes to use.

B. These drawings shall be used in the field for the actual installation of the work. Unless otherwise directed, they shall not be submitted for approval but three copies shall be provided to the Architect for his information.

3.22 OPERATING INSTRUCTIONS:

A. The Contractor for each section of the work hereunder shall, in cooperation with the representatives of the manufacturers of the various equipment items, carefully instruct the Owner's representatives in the proper operation of each item of equipment and of each system. During the balancing and adjusting of systems, the Owner's representative shall be made familiar with all procedures.

B. The contractor shall coordinate the date and time for the training with the Owner’s representative and shall document attendance with a sign-in sheet. At a minimum, the sign-in sheet shall indicate the date and location of the session, name and organization of each participant, and a list of any material that may be provided. This information shall be provided to the Architect as part of the closeout documents. Failure to provide documentation of training may require the contractor to provide a subsequent training session.

3.23 OPERATING MANUALS:

A. Prepare and submit 3 copies of the operating manuals bound in hard covers. Three weeks prior to completion of the work, the Architect will check the manuals and any additional material necessary to complete the manuals shall be furnished and inserted by the Contractor.

B. Manuals shall contain the following data:
1. Catalogue data of all equipment.
2. Shop drawings of all equipment.
3. Temperature control drawings (reduced in size)
4. Start-up instructions for major equipment.
5. Trouble shooting procedures for major equipment.
6. Wiring diagrams.
7. Recommended maintenance schedule for equipment.
8. Parts list for all items.
9. Name and address of each vendor.

3.24 COMPLETION REQUIREMENTS:

A. Before acceptance and final payment the Contractor under each Division of the specifications shall furnish:
1. Accurate record drawings, shown in red ink on blue line prints furnished for that purpose all changes from the original plans made during installation of the work. Drawings shall be filed with the Architect when the work is completed.
2. All manufacturers' guarantees.

3. All operating manuals.
4. Guarantees.

3.25 CONTRACTOR'S RESPONSIBILITY FOR FINAL INSPECTION:

1. Before calling for the final inspection, the Contractor under each Division shall carefully inspect his work to be sure it is complete and according to plans and specifications.

END OF SECTION 21 05 00

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SECTION 21 22 00

CLEAN-AGENT FIRE-EXTINGUISHING 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. Clean-agent systems.
2. Pipe and fittings.
3. Valves.
4. Extinguishing-agent containers.
5. Fire-extinguishing clean agent.
6. Discharge nozzles.
7. Manifold and orifice unions.
8. Fire control panels.
9. Detection devices.
10. Manual stations.
11. Switches.
12. Alarm devices.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. EPO: Emergency Power Off.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For clean-agent fire-extinguishing system signed and sealed by a qualified professional engineer.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include design calculations.
3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For clean-agent fire-extinguishing system signed and sealed by the qualified professional engineer.

1. Indicate compliance with performance requirements and design criteria, including analysis data.
2. Include design calculations for weight, volume, and concentration of extinguishing agent required for each hazard area.
3. Indicate the Following on Reflected Ceiling Plans:

    a. Ceiling penetrations and ceiling-mounted items.
    b. Extinguishing-agent containers if mounted above floor, piping and discharge nozzles, detectors, and accessories.
    c. Method of attaching hangers to building structure.
    d. Other ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.

4. Indicate the Following on Occupied Work Area Plans:

    a. Controls and alarms.
    b. Extinguishing-agent containers, piping and discharge nozzles if mounted in space, detectors, and accessories.
    c. Equipment and furnishings.

5. Indicate the Following on Access Floor Space Plans:

    a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
    b. Method of supporting piping.

6. Indicate the Following on Ceiling Plans:

    a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
    b. Method of supporting piping.
    c. Other equipment located in the ceiling space that is being protected including sprinkler piping, HVAC equipment, raceways, or conduit.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Domestic water piping.
2. Items Penetrating Finished Ceiling Include the Following:

    a. Lighting fixtures.
    b. Air outlets and inlets.

B. Design Data:

1. Permit Approved Drawings: Working plans, prepared according to NFPA 2001, that have been approved by authorities having jurisdiction. Include design calculations.

C. Seismic Qualification Data: Certificates, for extinguishing-agent containers and control panels 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. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For special agent system 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. Deliver extra materials to Owner.

1. Detection Devices: Not less than 20 percent of amount of each type installed.
2. Container Valves: Not less than 10 percent of amount of each size and type installed.
3. Nozzles: Not less than 20 percent of amount of each type installed.
4. Extinguishing Agent: Not less than 100 percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

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. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Global's "Approval Guide."

C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

PART 2 - PRODUCTS

2.1 CLEAN-AGENT 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. 3M Novec 1230 Fire Protection Fluid

B. Description: Clean-agent fire-extinguishing system shall be an engineered system for total flooding of the hazard area including the room cavity above the ceiling, below the ceiling, and below the raised floor. System includes separate zones above and below the ceiling and beneath the raised floor. If smoke is detected below the raised floor, extinguishing agent shall be discharged in the underfloor zone only. If smoke is detected below the ceiling, extinguishing agent shall be discharged in zones above and below the ceiling and below the floor. If smoke is detected above the ceiling, extinguishing agent shall be discharged in the zone above the ceiling only.

C. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class A, B, and C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.

D. Design, supply and install a complete clean agent total flooding fire suppression system using agent manufactured by a reputable manufacturer with a process known as electrochemical fluorination. (Hereafter referred to as SYSTEM)

E. Cross-Zoned Detection: Devices located in two separate zones. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating single-detection device in other zone.

F. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.

G. System Operating Sequence:

1. Actuating First Detector: Visual indication on annunciator panel. Energize audible and visual alarms (slow pulse), shut down air-conditioning and ventilating systems serving protected area, close doors in protected area, and send signal to fire-alarm system.
2. Actuating Second Detector: Visual indication on annunciator panel. Energize audible and visual alarms (fast pulse), shut down power to protected equipment, start time delay for extinguishing-agent discharge for 30 seconds (adjustable), and discharge extinguishing agent.
3. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area.

H. System Operating Sequence: System shall be cross-zoned, air-sampling detectors and photoelectric detectors reporting to a fully programmable microprocessor-based control panel programmed to operate as follows:

1. If one photoelectric detector and air-sampling detector reaches the third detection level (Fire 1), agent discharge will be initiated as described for the third detection level (Fire 1) below.
2. Air-Sampling System:

    a. First Detection Level (Alert): Mild audible and visual indication on annunciator panel. Strobe lights flash slowly in the protected area.
    b. Second Detection Level (Action): Strong audible and visual indication on annunciator panel. Strobe lights flash rapidly in the protected area.
    c. Third Detection Level (Fire 1): Strong audible and visual indication on annunciator panel. Energize horn(s), bell(s), and strobe light(s) in the protected area and outside entry doors. Shut down air-conditioning and ventilating systems serving the protected area, and close doors in the protected area. Send signal to fire-alarm system, initiate 30-second time delay for extinguishing-agent discharge, and discharge extinguishing agent. At agent discharge, terminate power to equipment in the protected area.
    d. Fourth Detection Level (Fire 2): Same as Fire 1.

I. Manual stations shall immediately discharge extinguishing agent when activated.

J. Operating abort switches will delay extinguishing-agent discharge while being activated, and switches must be reset to prevent agent discharge. Release of hand pressure on the switch will cause agent discharge if the time delay has expired.

K. EPO: Will terminate power to protected equipment immediately on actuation.

L. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.

M. Power Transfer Switch: Transfer from normal to stand-by power source.

N. Seismic Performance: Fire-suppression piping and containers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 PIPE AND FITTINGS

A. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.

B. Steel Pipe: ASTM A53/A53M, Type S, Grade B or ASTM A106/A106M, Grade A Schedule 40, Schedule 80, and Schedule 160, seamless steel pipe.

1. Threaded Fittings:

a. Malleable-Iron Fittings: ASME B16.3, Class 300.
b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
c. Fittings Working Pressure: 620 psig minimum.
d. Flanged Joints: Class 300 minimum.

2. Forged-Steel Welding Fittings: ASME B16.11, Class 3000, socket pattern.
3. Steel, Grooved-End Fittings: FM Approved and NRTL listed, ASTM A47/A47M malleable iron or ASTM A536 ductile iron, with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

C. 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.

D. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.

E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

2.3 VALVES

A. General Valve Requirements:

1. UL listed or FM Approved for use in fire-protection systems.

2. Compatible with type of clean agent used.

B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.

C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.

D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.4 EXTINGUISHING-AGENT CONTAINERS

A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.

1. Finish: enamel or epoxy paint.
2. Manifold: Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.
3. Manifold: Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.
4. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

2.5 FIRE-EXTINGUISHING CLEAN AGENT

A. Agent shall be manufactured at an ISO 9001 and ISO 14001 registered facility.

B. Clean Agent Fluid shall have an Ozone Depletion Potential (ODP) of zero. ODP as defined by the US EPA.

C. Clean Agent Fluid shall have a Global Warming Potential (GWP) of < 1 (100 year ITH). GWP as defined by the Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC AR5) or in US EPA documentation and approvals.

D. Clean Agent Fluid shall not be one of these greenhouse gases or ozone depleters; Perfluorocarbons (PFCs), Hydrofluorocarbons (HFCs), and Hydrochlorofluorcarbons (HCFCs).

E. Agents will not be restricted for use in fire protection due to its Ozone Depletion Potential (ODP) or Global Warming Potential (GWP) and is not targeted for phase-down by the Montreal Protocol, nor subject to the European F-Gas Regulations targeting the phase-down of production and import of HFCs into Europe; and will not be affected by U.S. EPA SNAP regulations which would render it either unacceptable or acceptable subject to narrow use limits.1

F. Clean Agent must have a minimum safety factor 60% between the design concentration percentage and the No Observed Adverse Effect Level (NOAEL) for Class A and C hazards. For guidance on safety factors for Class B hazards, contact an approved Original Equipment Manufacturer.

G. The minimum extinguishing concentration (MEC) determined by test as witnessed per recognized testing laboratory standards (i.e UL 2166, FM 5600) shall be no greater than 3.3%.

H. Equipment shall be UL listed and FM approved and extinguishing agent shall be component recognized by UL or FM for use in the system.

I. System cylinders shall be labeled indicating the system manufacturer and agent brand. System service and refill shall be by an authorized manufacturer's representative and shall be the agent of the original installation brand.

2.6 DISCHARGE NOZZLES

A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.

B. Material: Corrosion-resistant metal.

C. Stamped with orifice size and type.

2.7 MANIFOLD AND ORIFICE UNIONS

A. Description: NRTL-listed device with minimum 2175-psig pressure rating, to control flow and reduce pressure of IG-541 gas in piping.

1. NPS 2 and Smaller: Piping assembly with orifice, sized for system design requirements.

2.8 FIRE CONTROL PANELS

A. Description: FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.

B. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.

C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.

D. Supervised Circuits: Separate circuits for each independent hazard area.

1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
2. Manual pull-station circuit.
3. Alarm circuit.
4. Release circuit.
5. Abort circuit.
6. EPO circuit.

E. Control-Panel Features:

1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
2. Automatic switchover to standby power at loss of primary power.
3. Storage container, low-pressure indicator.
4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.

F. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless-steel or aluminum enclosure.

G. Standby Power: Sealed lead calcium batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.9 DETECTION DEVICES

A. General Requirements for Detection Devices:

1. Comply with NFPA 2001, NFPA 72, and UL 268.
2. 24-V dc, nominal.

B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.

C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.

D. Remote Air-Sampling Detector System: Includes air-sampling pipe network, a laser-based photoelectric detector, a sample transport fan, and a control unit.

1. Pipe Network: CPVC tubing connects control unit with calibrated sampling holes.
2. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of four preset values.
3. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of 0.05-inch wg at all sampling ports.
4. Control Unit: Multizone unit as indicated on Drawings. Provides same system power supply, supervision, and alarm features as specified for the control panel plus separate trouble indication for airflow and detector problems.

E. Signals to the Central Fire Alarm Control Panel: Any type of local system trouble is reported to the central fire alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to the central fire alarm control panel as separately identified zones.

2.10 MANUAL STATIONS

A. General Description: FM Approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.

B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.

C. Abort Switch: "ABORT" caption, momentary contact, with green finish.

D. EPO Switch: "EPO" caption, with yellow finish.

2.11 SWITCHES

A. Description: FM Approved or NRTL listed, where available, [**120-V**] <**Insert value**> ac or low voltage compatible with controls. Include contacts for connection to control panel.

1. Low-Agent Pressure Switches: Pneumatic operation.
2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
3. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

2.12 ALARM DEVICES

A. Description: Listed and labeled by an NRTL or FM Approved, low voltage, and surface mounting. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" or Section 284621.13 "Conventional Fire-Alarm Systems" for alarm and monitoring devices.

B. Bells: Minimum 6-inch diameter.

C. Horns: 90 to 94 dBA.

D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PIPING APPLICATIONS

A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.

B. NPS 2 and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.

3.3 CLEAN-AGENT PIPING INSTALLATION

A. Install clean-agent extinguishing piping and other components level and plumb, according to manufacturers' written instructions.

B. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.

C. Install extinguishing-agent containers anchored to substrate.

D. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section "Distribution."

1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.
2. Support piping using supports and methods according to NFPA 13.
3. Install seismic restraints for extinguishing-agent containers and piping systems.
4. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

C. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Section 284621.11 "Addressable Fire-Alarm Systems" or Section 284621.13 "Conventional Fire-Alarm Systems."

3.5 IDENTIFICATION

A. Identify system components and equipment. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001.

C. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.

D. Install signs at entry doors to advise persons outside the room the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. 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.

D. Tests and Inspections:

1. After installing clean-agent extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Units will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.7 CLEANING

A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices.

3.8 SYSTEM FILLING

A. Preparation:

1. Verify that piping system installation is completed and cleaned.
2. Check for complete enclosure integrity.
3. Check operation of ventilation and exhaust systems.

B. Filling Procedures:

1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
2. Install filled extinguishing-agent containers.
3. Energize circuits.
4. Adjust operating controls.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain clean-agent fire-extinguishing systems.

END OF SECTION 212200

[1] **Acceptable with Narrowed Use Limits**: For non-residential uses where other alternatives are not technically feasible due to performance or safety requirements: a. because of their physical or chemical properties, or b. where human exposure to the extinguishing agents may result in failure to meet applicable narrowed use limits.

18465.01

SECTION 23 05 00

COMMON WORK RESULTS 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 CHECKING DOCUMENTS:

A. The drawings and the specifications are numbered consecutively. The Contractor shall check the drawings and specifications thoroughly and shall notify the Architect of any discrepancies or omissions of sheets or pages. Upon notification, the Architect will promptly provide the Contractor with any missing portions of the drawings or specifications. No discrepancies or omissions of sheets or pages of the contract documents will relieve the Contractor of his duty to provide all work required by the complete contract documents.

1.3 SUMMARY

A. This Section includes the following:
1. General Provisions for Construction
2. Piping materials and installation instructions common to most piping systems.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.
12. Close-out Documents and Requirements

1.4 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install," "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" always refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

G. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

H. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

I. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

J. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

K. 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.

L. The following are industry abbreviations for plastic materials:
1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

M. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.5 GENERAL:

A. In general, the lines and ducts to be installed by the various trades under these specifications shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards as to complete the work in a neat and satisfactorily workable manner. The following is a general outline concerning the running of various lines and ducts and is to be excepted where the drawings or conditions at the building necessitate deviating from these standards.

B. All piping and ductwork for the mechanical trade shall be concealed in chases in finished areas, except as indicated on the drawings. Horizontal lines run in areas that have ceilings shall be run concealed in those ceilings, unless otherwise specifically indicated or directed.

C. Piping and ductwork may be run exposed in machinery and equipment spaces, where serving as connections to equipment items in finished rooms where exposed connections are required, and elsewhere as indicated on the drawings or required.

D. The Contractor shall thoroughly acquaint himself with the details of the construction and finishes before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details. Place all inserts in masonry walls while they are under construction. All concealed lines shall be installed as required by the pace of the general construction to precede that general construction.

E. The mechanical plans do not give exact details as to elevations of lines and ducts, exact locations, etc., and do not show all the offsets, control lines, pilot lines and other installation details. The Contractor shall carefully lay out his work at the site to conform to the architectural

and structural conditions, to provide proper grading of lines, to avoid all obstruction, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation.

F. The mechanical plans do not give exact locations of outlets, fixtures, equipment items, etc. The exact location of each item shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with other sections. Minor relocations necessitated by the conditions at the site or as directed by the Architect shall be made without any additional cost accruing to the Owner.

G. The Contractor shall be responsible for the proper fitting of his material and apparatus into the space. Should the particular equipment which any bidder proposes to install require other space conditions than those indicated on the drawings, he shall arrange for such space with the Architect before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such necessary changes at his (the Contractor's) own expense.

H. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans. The drawings shall be checked by the Architect before the work is started. Any conflict with the building conditions shall be corrected by the Contractor before the work proceeds.

I. Order of precedence shall be observed in laying out the pipe, ductwork, material, and conduit in order to fit the material into the space above the ceiling and in the chases and walls. The following order shall govern:
   1. Items affecting the visual appearance of the inside of the building such as lighting fixtures, diffusers, grilles, outlets, panelboards, etc. Coordinate all items to avoid conflicts at the site.
   2. Lines requiring grade to function such as sewers.
   3. Large ducts and pipes with critical clearances.
   4. Conduit, water lines, and other lines whose routing is not critical and whose function would not be impaired by bends and offsets.

J. Piping and ducts serving outlets on items of equipment shall be run in the most appropriate manner. Where the equipment has built-in chases, the lines shall be contained therein. Where the equipment is of the open type, the lines shall be run as close as possible to the underside of the top and in a neat and inconspicuous manner.

K. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention before the contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus, material, or equipment.

L. The Contractor shall distinctly understand that the work described herein and shown on the accompanying drawings shall result in a finished and working job, and any item required to accomplish this intent shall be included whether specifically mentioned or not.

M. Each bidder shall examine the plans and specifications for the General Construction. If these documents show any item requiring work under Division 23 and that work is not indicated on the respective "M" drawings, he shall notify the Architect in sufficient time to clarify before bidding. If no notification is received, the Contractor is assumed to require no clarification, and shall install the work as indicated on the General Plans in accordance with the specifications.

1.6 DIMENSIONS:

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings. Any difference which may be found shall be submitted to the Architect for consideration before proceeding with the work.

1.7 INSPECTION OF SITE:

A. The accompanying plans do not indicate completely the existing mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.8 SUBMITTALS

A. Wherever shop drawings are called for in these specifications, they shall be furnished by the Contractor for the work involved after review by the Architect as to the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary details. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary and should there be any charges in connection with this, they shall be borne by the Contractor.

B. Shop drawings will be reviewed by the Architect for general compliance with the design concept of the project and general compliance with the information given in the contract documents. Review by the Architect and any action by the Architect in marking shop drawings is subject to the requirements of the entire contract documents. Contractor will be held responsible for quantities, dimensions which shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of all trades and the satisfactory performance of his work.

C. Shop drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission of individual items shall designate the exact item offered and shall clearly identify the item with the project.

D. All shop drawings shall be submitted at one time and shall consist of a bound catalogue of all shop drawings under each section, properly indexed and certified that they have been checked by the Contractor.

E. The omissions of any material from the shop drawings which has been shown on the contract drawings or specified, even though reviewed by the Architect, shall not relieve the Contractor from furnishing and erecting same.

F. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.

4. Escutcheons.
5. Material indicated in other Division 23 Sections.

G. Welding certificates.

1.9 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 HVAC 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. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.10 PERMITS, FEE, ETC.:

A. The Contractor under each section of these specifications shall arrange for a permit from the local authority. The Contractor shall arrange for all utility services, including sewer, water and gas services as applicable. If any charges are made by any of the utility companies due to the work on this project, the Contractor shall pay these charges, including charges for metering, connection, street cutting, etc. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.11 LAWS, CODES AND ORDINANCES:

A. All work shall be executed in strict accordance with all local, state and national codes, ordinances and regulations governing the particular class of work involved, as interpreted by the inspecting authority. The Contractor shall be responsible for the final execution of the work under this heading to suit those requirements. Where these specifications and the accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect, shall prepare any supplemental drawings required illustrating how the work may be installed so as to comply and, on approval, make the changes at no cost to the Owner. On completion of the various portions of the work the installation shall be tested by the constituted authorities, approved and, on completion of the work, the Contractor shall obtain and deliver to the Owner a final certificate of acceptance.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Where stored outside provide pipes and tubes with end caps. Maintain end caps through 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.

C. Refer to other Division 23 Sections for additional requirements.

1.13 GUARANTEE:

A. Unless a longer guarantee is hereinafter called for, all work, material and equipment items shall be guaranteed for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect, shall be repaired and/or replaced to the complete satisfaction of the Architect. Guarantee shall be in writing and in triplicate.

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.
      a. Where a definite material is mentioned in these specifications, it has been done in order to establish a standard. The product of the particular manufacturer mentioned is of satisfactory construction and any substitution must be of quality as good as or better than the named article. No substitution shall be made without review by the Architect, who will be the sole judge of equality.
      b. Should a substitution be accepted under the provisions of the conditions of these specifications, and should this substitute prove to be defective or otherwise unsatisfactory for the service for which it is intended within the guarantee period, the Contractor who originally requested the substitution shall replace the substitute material with the specified material.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 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 23 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-inchmaximum 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. Mechanical Couplings: Couplings shall be rigid or flexible type appropriate for each application and location, with housing fabricated in two or more parts of malleable iron castings, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Mechanical Coupling bolts shall be

zinc plated (ASTM B-633) heat treated carbon steel track head conforming to physical properties of ASTM A-183, minimum tensile strength 110,000 psi.

E. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

F. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

G. 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.

H. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 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-psigminimum working pressure at 180 deg F.
   1. Available Manufacturers:
      a. Capitol Manufacturing Co.
      b. Central Plastics Company.
      c. Eclipse, Inc.
      d. Epco Sales, Inc.
      e. Hart Industries, International, Inc.
      f. Watts Industries, Inc.; Water Products Div.
      g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psigminimum 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-psigminimum 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-psigminimum 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.

2.5 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.
   e. Link-Seal
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: Plastic. 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.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inchminimum 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.

2.7 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 or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, 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.

2.8 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 LARGE APPARATUS:

A. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through windows, doorways or shafts, shall be brought to the job by the Contractor involved and placed in the space before the enclosing structure is completed.

B. It is anticipated that an opening will be required in the existing building for installation of the large equipment. Cooperate with all trades to avoid a larger opening than is required. The openings shall be restored after installation of the equipment.

3.2 ACCESS PANELS:

A. Wherever mechanical and/or plumbing equipment is installed and where future access is required through either walls or ceilings and such cannot be obtained through the removable ceiling or through other means, the Contractor shall provide Milcor Style "M" access doors at least 24 inches by 24 inches in size or larger if required for access. Provide access doors for all fire dampers, smoke dampers, valves, etc. Provide rated access panels as required for installation in rated construction.

3.3 USE OF SYSTEMS:

A. It is considered that it will be necessary to operate the mechanical systems to provide heating and ventilation in portions of the building that are enclosed. As systems or portions of systems become operable, they shall be operated as required to maintain habitable conditions in enclosed portions of the building that are still under construction and portions that are fully complete as may be required to properly protect installed piping, equipment and finishes.

B. In order to provide protection to ducts, plenums, etc. install temporary filters over or in return air openings until all finished painting is completed. Protect supply outlets, coils, etc. as necessary in each case.

C. Except for operation of cooling equipment to prove its performance and to adjust and balance the systems, that equipment will not be operated for comfort of construction workers.

D. Immediately prior to the time that the systems are to be accepted by the Owner, each system shall be carefully examined and if ductwork is dirty, it shall be carefully cleaned by men skilled in that type of work. All filters shall be put in first class condition by replacement of filters and/or other procedures as directed.

E. The use of the equipment for maintaining environmental and/or protective temperature conditions shall in no way constitute acceptance of that equipment and the connected piping, ducts, insulation, finishes, etc. by the Owner. Furthermore, it shall in no way shorten the guarantee period hereinafter specified. The Contractor shall either secure extended warranties from the vendors of equipment or shall purchase insurance to provide proper coverage on the equipment through the guarantee period and shall file with the Architect substantiating affidavits from equipment manufacturers or a copy of the insurance policy covering the equipment through the guarantee period. The personal underwriting of the Contractor for equipment manufacturers' warranties is not acceptable, but his personal underwriting of piping, ductwork, insulation and associated materials is acceptable subject to the provisions of the contract.

F. The Contractor shall provide such labor as may be required in the operation of the systems and shall pay all costs.

3.4 OWNERS OCCUPANCY:

A. It shall be understood that the building in which the work is to be done is a necessary part of the Owner's operation, and shall continue in use throughout the construction period without interruption. Take all precautions required by the Owner for the protection of his equipment and property.

B. Contractor shall cooperate with the owner in scheduling areas in which work is permitted. Owners schedule will govern.

3.5 SCHEDULE OF WORK:

A. The Contractor shall program his work in such manner as to interfere as little as possible with the normal routine of the Owner. It must be understood that the Owner will continue to function throughout the construction period. All water and sanitary facilities shall therefore be continued in operation with a minimum of interruption and the Contractor shall make any temporary connections necessary to comply with this requirement.

B. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to insure meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates, schedule the times of work in the various areas involved, etc. Each Contractor shall cooperate in establishing these times and locations and shall process his work so as to insure the proper execution of it.

C. Under no condition shall any work be done in the present building that would interfere with its natural use during its normal hours of occupancy, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to present lines or items of equipment in that building or where present equipment items in that building are to be relocated or modified in any way. The Contractor shall include this scheduling requirement in his proposal as no additional compensation for overtime work will be granted.

3.6 WORKING TIME:

A. Where new connections are to be made into existing lines, present lines must be relocated or rerouted, present equipment items relocated or other work accomplished that would affect the

operation of the present building, the work shall be carried on at such times as to cause a minimum of interference with the normal operation of that building. In certain cases the work may be accomplished during normal working hours during certain designated seasons or times of the year. In other cases the work may have to be executed during times of the day outside of the normal working period, on holidays, etc. Each individual case presents a separate decision as to the time during which it shall be performed. The Contractor involved shall present each case to the Architect for his decision, which will be made after due consultation with the Owner. No additional compensation for overtime will be granted for compliance with these requirements.

3.7 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.

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. This shall include space between adjacent pipes or crossing pipes.

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 or split-casting, cast-brass type with polished chrome-plated finish.
      f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

2. Existing Piping: Use the following:
   a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
   b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
   c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
   d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
   e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
   f. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
   g. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

M. 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, plumbing chases, or other wet areas 2 inchesabove finished floor level.
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 07 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 07 Section "Joint Sealants" for materials and installation.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inchannular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inchesin diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inchesand 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.

O. 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-inchannular 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.

P. 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 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.8 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 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. Mechanical Joints: Grooved ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with coupling manufacturer's recommended lubricant to facilitate installation. All grooved components (couplings, fittings, valves, gaskets, and specialties) shall be of one manufacturer. Pipe grooving or rolling shall be in accordance with the manufacturer's specifications contained in the latest published literature.

3.9 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2and 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.

3.10 ELECTRICAL WIRING:

A. All electric wiring of every character, except for temperature control, shall be done under Division 26 of these specifications. The Contractor for each section shall erect all his motors in place ready for connections. The Contractor, under Division 26, shall mount all the starters and controls, furnishing the supporting structures and any required outlet boxes.

B. Every electrical current consuming device furnished as a part of this project, or furnished by the Owner and installed in this project, shall be completely wired up under Division 26. Verification of exact location, method of connection, number and size of wires required, voltage requirements, and phase requirements is the responsibility of the Contractor under Division 26. If conflicts occur between the drawings and the actual requirements, actual requirements shall govern.

3.11 SEALING AROUND PIPES, DUCTS, ETC.:

A. The Contractor installing pipes, ducts, etc. shall seal all spaces between pipes and/or sleeves where they pierce walls, partitions or floors with Johns-Manville Firetemp CI intumescent caulk or as directed by architect. The packing shall effect a complete fire and/or air seal where pipes, ducts, etc., pierce walls, floors or partitions.

3.12 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 HVAC equipment to facilitate service, maintenance, and repair or replacement of components. 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.

E. Rough-In and Final Connection for Equipment:
1. The shop drawings for all equipment are hereby made a part of these specifications. The Contractor under each section of the specifications shall rough-in for the exact item to be furnished on the job, whether in another section of the specifications or by the Owner. The Contractor shall refer to all drawings and other sections of the specifications for the scope of work involved for the new equipment, and by actual site examination determine the scope of the required equipment connections for the Owner furnished equipment.
2. Should any of the equipment furnished require connections of a nature different from that shown on the drawings, report the matter to the Architect and finally connect as directed by the Architect.
3. Should any shop drawings not be available for equipment furnished under other contracts or by the Owner, the Contractor under each section of these specifications shall bid the work as detailed on the drawings.
4. Minor differences in the equipment furnished and that indicated on the drawings will not constitute ground for additional payment to the Contractor.

3.13 PROGRESS OF WORK:

A. The Contractor shall keep himself fully informed as to the progress of the work and do his work at the proper time without waiting for notification from the Architect or Owner.

3.14 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC 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 HVAC items requiring access that are concealed behind finished surfaces.

3.15 MANUFACTURER'S DIRECTIONS:

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer.

3.16 MATERIALS AND WORKMANSHIP:

A. All materials shall be new unless otherwise specified and of the quality specified. Materials shall be free from defects. All materials of a type for which the Underwriters Laboratories, Inc. have established a standard shall be listed by the Underwriters Laboratories, Inc. and shall bear their label.

B. Wherever the make of material or apparatus required is not definitely specified, the Contractor shall submit a sample to the Architect before proceeding.

C. The Architect reserves the right to call for samples of any item of material offered in substitution, together with a sample of the specified material, when, in the Architect's opinion, the quality of the material and/or the appearance is involved and it is deemed that an evaluation of the two materials may be better made by visual inspection. This shall be limited to plumbing brass, grilles, registers, ceiling outlets and similar items and shall not be applicable to major manufacturers' items of equipment.

D. The Contractor shall be responsible for transportation of his materials to and on the job, and shall be responsible for the storage and protection of these materials and work until the final acceptance of the job.

E. The Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.

F. The workmanship shall in all respects be of the highest grade and all construction shall be done according to the best practice of the trade.

3.17 PROTECTION OF APPARATUS:

A. The Contractor shall at all times take such precautions as may be necessary to properly protect his new apparatus from damage. This shall include the erection of all required temporary shelters to adequately protect any apparatus stored in the open on the site, the cribbing of any apparatus above the floor of the construction, and the covering of apparatus in the incompleted building with tarpaulines or other protective covering. Failure on the part of the Contractor to

comply with the above to the entire satisfaction of the Architect will be sufficient cause for the rejection of the pieces of apparatus in question.

3.18 COOPERATION AND CLEANING UP:

A. The contractor for the work under each section of these specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

3.19 COORDINATION OF TRADES:

A. The Contractor shall be responsible for resolving all coordination required between trades. For example, items furnished under Division 23 which require electrical connections shall be coordinated with Division 26 for:
1. Voltage
2. Phase
3. Ampacity
4. No. and size of wires
5. Wiring diagrams
6. Starter size, details and location
7. Control devices and details

B. Items furnished under various sections which require plumbing connections shall be coordinated for services, pressure, size and location of connections, type of fuel, clearances for service, auxiliary devices required, etc.

C. Items requiring insulation shall be fully insulated and that insulation shall be checked against manufacturer's directions and job requirements for suitability, coverage, thickness and finish.

D. Items installed in/on finished ceilings shall be coordinated with the ceiling construction. The Contractor under each section shall conform to the reflected ceiling plan and shall secure details and/or samples of the ceiling materials as necessary to insure compatibility. Any device not conforming to this requirement shall be replaced by the Contractor at his expense.

E. All items specified under Division 23 shall be installed tight, plumb, level, square and symmetrically placed in relation to the work of other trades.

3.20 TESTING:

A. The Contractor under each division shall at his own expense perform the various tests as specified and required by the Architect and as required by the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests. Notify the Architect a minimum of 24 hours in advance of all tests.

3.21 PAINTING

A. All painting shall be done by the Contractor under Division 09. Following is a general outline of the required work for Division 23.
   1. When the factory finish on any apparatus or equipment is marred, it shall be touched up and then given one coat of half flat half enamel, followed by a coat of machinery enamel of a color to match the original. Paint factory primed surfaces.
   2. Paint all exposed pipe, cabinets, hangers and supports and miscellaneous metal.
   3. Paint all exposed sheet metal.
   4. Paint all insulated surfaces exposed to view, including piping, equipment, etc. Size surfaces until a smooth, non grainy surface is obtained.
   5. Generally, painting is required on all surfaces such that no exposed bare metal or insulation surface is visible.
   6. Paint all surfaces above or behind perforated return air grilles or other open spaced air outlet devices with flat black paint. All pipes, conduits, ductwork and structural members shall be painted. These surfaces shall be painted a distance away from the grille such that no unpainted surfaces are visible to a person standing on the room side and viewing through the device.

3.22 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 incheslarger 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-inchcenters 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 03 Section.

3.23 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.24 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment where indicated on the drawings.

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.

3.25 GROUTING

1. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
2. Clean surfaces that will come into contact with grout.
3. Provide forms as required for placement of grout.
4. Avoid air entrapment during placement of grout.
5. Place grout, completely filling equipment bases.
6. Place grout on concrete bases and provide smooth bearing surface for equipment.
7. Place grout around anchors.
8. Cure placed grout.

3.26 INSTALLATION DRAWINGS:

A. It shall be incumbent upon the Contractor to prepare special drawings as called for elsewhere herein or as directed by the Architect to coordinate the work under each section, to illustrate changes in his work, to facilitate its concealment in finished spaces to avoid obstructions or to illustrate the adaptability of any item of equipment which he proposes to use.

B. These drawings shall be used in the field for the actual installation of the work. Unless otherwise directed, they shall not be submitted for approval but three copies shall be provided to the Architect for his information.

3.27 OPERATING INSTRUCTIONS:

A. The Contractor for each section of the work hereunder shall, in cooperation with the representatives of the manufacturers of the various equipment items, carefully instruct the Owner's representatives in the proper operation of each item of equipment and of each system. During the balancing and adjusting of systems, the Owner's representative shall be made familiar with all procedures.

B. The contractor shall coordinate the date and time for the training with the Owner’s representative and shall document attendance with a sign-in sheet. At a minimum, the sign-in sheet shall indicate the date and location of the session, name and organization of each participant, and a list of any material that may be provided. This information shall be provided to the Architect as part of the closeout documents. Failure to provide documentation of training may require the contractor to provide a subsequent training session.

3.28 OPERATING MANUALS:

A. Prepare and submit 3 copies of the operating manuals bound in hard covers. Three weeks prior to completion of the work, the Architect will check the manuals and any additional material necessary to complete the manuals shall be furnished and inserted by the Contractor.

B. Manuals shall contain the following data:

1. Catalogue data of all equipment.
2. Shop drawings of all equipment.
3. Temperature control drawings (reduced in size)
4. Start-up instructions for major equipment.
5. Trouble shooting procedures for major equipment.
6. Wiring diagrams.
7. Recommended maintenance schedule for equipment.
8. Parts list for all items.
9. Name and address of each vendor.

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3.29 COMPLETION REQUIREMENTS:

A. Before acceptance and final payment the Contractor under each Division of the specifications shall furnish:
   1. Accurate record drawings, shown in red ink on blue line prints furnished for that purpose all changes from the original plans made during installation of the work. Drawings shall be filed with the Architect when the work is completed.
   2. All manufacturers' guarantees.
   3. All operating manuals.
   4. Guarantees.
   5. Test and Balance Report.

3.30 CONTRACTOR'S RESPONSIBILITY FOR FINAL INSPECTION:

1. Before calling for the final inspection, the Contractor under each Division shall carefully inspect his work to be sure it is complete and according to plans and specifications.

END OF SECTION 23 05 00

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SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC 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 ac 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 requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

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: Separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F unless otherwise indicated.

I. 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.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

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. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. 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. Split phase for motors smaller than 1/6 hp.
2. Capacitor start, capacitor run for motors 1/6 hp and larger.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre-lubricated, 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 23 05 13

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SECTION 23 05 29

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.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. 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 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 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.

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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.

C. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
   2. 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. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.
      c. Flex-Strut Inc.
      d. GS Metals 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. Anvil International; a subsidiary of Mueller Water Products Inc.
b. Empire Industries, Inc.
c. ERICO International Corporation.
d. Haydon Corporation; H-Strut Division.
e. NIBCO INC.
f. PHD Manufacturing, Inc.
g. 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 in-turned 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.

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. ERICO International Corporation.
3. National Pipe Hanger Corporation.
4. PHS Industries, Inc.
5. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
6. Rilco Manufacturing Co., Inc.
7. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-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, 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. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:
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 or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. 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: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. 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: Refer to Section 23 05 00.

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. 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 and seismic 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. 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 carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. 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. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
   3. 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.
   4. 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.
   5. 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.
   6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
   7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.

11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. 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.

J. 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.

K. 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. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. 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.

M. 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.

N. 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.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

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SECTION 23 05 53

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. Pipe labels.
   3. Manual balancing damper flags.
   4. Valve 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. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 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 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 self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction. Color scheme shall comply with ANSI A13.1.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. 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.

2.3 MBD FLAGS

A. Material: Fluorescent yellow 1-3/16" wide plastic flagging tape

2.4 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 minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass 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.

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 Division 09."

B. 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.

3.4 DUCT MBD FLAG INSTALLATION

A. Install plastic flags at each manual balancing damper to hang a minimum of 12” below bottom of the duct.

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. Chilled Water: 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. Chilled Water: Natural.
      b. Hot Water: Natural.
      c. Gas: Natural.
   3. Letter Color:
      a. Chilled Water: Black.
      b. Hot Water: Black.
      c. Gas: Black.

END OF SECTION 23 05 53

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SECTION 23 05 93

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. Scope: The test and balance on mechanical equipment shall be performed by an independent third party. Contractor shall prepare for, schedule and otherwise coordinate test and balancing services to be performed as specified.

B. The contract for the test and balance scope of work shall fall under the scope of the general contractor.

C. Section Includes:
   1. Balancing Air Systems:
      a. Constant-volume air systems.
      b. 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

A. LEED Submittals:
   1. Air-Balance Report for Prerequisite IEQ 1: Documentation of work performed for ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
   2. TAB Report for Prerequisite EA 2: Documentation of work performed for ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 15 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 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 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. 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.
a. Certify TAB field data reports and perform the following:
2. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
3. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

B. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

E. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 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 Division 23 Section "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 terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. 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. Hydronic 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 ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

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, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC 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 Division 23 Section "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 Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 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.

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 steam coil:
   1. Dry-bulb temperature of entering and leaving air.
   2. Airflow.
   3. Air pressure drop.
   4. Inlet steam pressure.

D. 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 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent to minus 0 percent.
   2. Air Outlets and Inlets: Plus or minus 5 percent but with each room/zone totaling plus 5 or minus 0 percent..
   3. Heating-Water Flow Rate: Plus 5 or minus 0 percent.
   4. Cooling-Water Flow Rate: Plus 5 or minus 0 percent.

3.11 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 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.

3.12 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. 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.

H. 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.

I. 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.

J. Air-Terminal-Device Reports:

1. Unit Data:
a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):
a. Air flow rate in cfm.
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

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.

3.13 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 by Architect.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect.
3. Architect or Owner shall 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.

3.14 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.

END OF SECTION 23 05 93

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SECTION 23 07 19

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.

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).

1.4 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.

1.5 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 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.

1.6 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.

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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. 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.
      c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. 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. 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-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ 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.

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:

B. 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., a business of H. B. Fuller Company; 85-75.
      d. K-Flex USA; R-373 Contact Adhesive.

C. 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., a business of H. B. Fuller Company; CP-127.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
      d. Mon-Eco Industries, Inc.; 22-25.

D. 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., a business of H. B. Fuller Company; CP-82.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
      d. Mon-Eco Industries, Inc.; 22-25.

E. 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.
      c. P.I.C. Plastics, Inc.; Welding Adhesive.
      d. Speedline Corporation; Polyco VP Adhesive.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

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., a business of H. B. Fuller Company; 30-80/30-90.
      b. Vimasco Corporation; 749.

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. 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., a business of H. B. Fuller Company; Encacel.
   b. Eagle Bridges - Marathon Industries; 570.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 permat 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.

2.4 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, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
   b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 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.

2.5 SEALANTS

A. FSK and Metal Jacket 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., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 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.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket 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., a business of H. B. Fuller Company; 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.

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. 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.

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., a business of H. B. Fuller Company; Chil-Glas Number 10.

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 pipe.
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., a business of H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.8 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, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.9 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, available products that may be incorporated into the Work include, but are not limited to, 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: Color-code jackets based on system. Color as selected by Architect.
4. 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.

D. Metal 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. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 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 and Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
   d. 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.

E. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with stucco-embossed aluminum-foil facing.
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. Polyguard Products, Inc.; Alumaguard 60.

2.10 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, available products that may be incorporated into the Work include, but are not limited to, 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. 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, available products that may be incorporated into the Work include, but are not limited to, 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.

C. 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, available products that may be incorporated into the Work include, but are not limited to, 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.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
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. 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.

2.11 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/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or 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.

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 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. 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.

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.

3.6 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.

3.7 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 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. 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.

3.9 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
   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.

3.10 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.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 deg F:
   1. All Pipe Sizes: Insulation shall be one of the following:
      a. Flexible Elastomeric: 1/2 inch thick.
      b. Mineral-Fiber, Preformed Pipe, Type I: 1 inch.

B. Refrigerant Suction and Hot-Gas Piping:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Flexible Elastomeric: 1 inch thick.

3.12 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. None.

D. Piping, Exposed:
   1. PVC, Color-Coded by System: 20 mils thick.

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3.13 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. None.

D. Piping, Exposed (Condensate and Refrigerant Lines):
   1. PVC: 30 mils thick.
   2. Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.016 inch thick.

END OF SECTION 23 07 19

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SECTION 23 09 00

FACILITY MANAGEMENT SYSTEMS

PART 1 - GENERAL

1.1 SCOPE:

A. Furnish and install a new Direct Digital Control system which will control points and equipment as identified on the control drawings and input/output summary. Controllers to be used must be installed and programmed per published manufacturer specification technical sheets. NO PROGRAM IS TO BE USED IN ANY CONTROLLER THAT IS NOT OWNER MODIFIABLE. Approved vendors are Automated Logic Corp., and Alerton Controls. Both vendors upon bidding agree to sell any controller product needed to the winning bid vendor, at no more than current public published pricing.

B. The FMS for this facility will be required to communicate with and seamlessly integrate with the existing Automated Logic host end system (located in the Williamson County Building). No additional personal computers, operator workstations, or operator interface will be required beyond that which is existing at the central office. The site to site communications will be ethernet. FMS interface is to be compatible with the County's existing controls graphical and logic software (Supervision or WEB Ctrl and Eikon by Automated Logic Corp.) by either direct or via Native BACnetTM protocol. All field logic controllers must be programmed to run the sequence logic in an occupied mode in case of loss in communications between the controllers and the Host. Non Automated Logic Corporation vendors (Alerton Controls) will adhere to the following conditions:

1. Program a default logic in the controllers to maintain stand alone occupied
2. temperature set points. (the default will trigger when communications is lost between the Vendors communications interface portal and the appropriate Automated Logic Portal or LGE, and the Vendors communications interface portal and the Vendor controllers.
3. The Vendor will program the standard sequence logic using Automated Logic Eikon and Supervision software.
4. The Vendor will create thermographic floor plans and unit graphics.
5. The Vendor will purchase and provide the Automated Logic onsite LGE gateway.
6. The Vendor will provide the necessary Ethernet hubs and routers to link the two systems at the site level.
7. The Vendor will provide the necessary Automated Logic communications BPM Portals or any Automated Logic controller that can hold 59 function memory blocks, (Portals will hold the logic program and each can handle 390 points with up to 59 function logic blocks dependent on the size of logic, should be able to handle logic for up to 59 units.

C. Although such work is not specifically indicated, provide all supplementary or miscellaneous items, appurtenances, training and devices incidental to or necessary for a sound, secure and complete installation.

1.2 SYSTEM REQUIREMENTS:

A. All material and equipment used shall be standard components, regularly manufactured and available and not custom designed especially for this project. All systems and components, except site specific software, shall have previously been thoroughly tested and proven in actual use prior to installation on this project.

B. The system architecture shall be fully modular permitting expansion of application software, system peripherals, and field hardware.

C. The system, upon completion of the installation and prior to acceptance of the project, shall be performance demonstrated and verified to perform all operating functions and sequences as detailed in this specification.

D. All drawings shall be reviewed after the final system checkout and updated or corrected to provide 'as-built' drawings to show exact installation. A floor plan drawing will show LAN and sub-LAN riser as pulled on-site. All shop drawings will be acknowledged in writing by Williamson County before installation is started and again after the final checkout of the system. The system will not be considered complete until the 'as-built' drawings have received their final approval. Electronic record of the as-builts will be in Visio and PDF format to the Williamson County Energy Management Department for future use in modifications and documentation.

1.3 EQUIPMENT:

A. All distributed, standalone and unitary controllers supplied shall be in compliance with the following listings and standards:
   1. UL916 for Open Energy Management.
      a. FCC Part 15, Sub-Part B, Class A.
      b. CE Electro Magnetic Compatibility.

B. The control system manufacturer shall be ISO9001 listed for design and manufacture of environmental Control systems for precise control and comfort, indoor air quality, HVAC plant operation, energy savings and preventative maintenance.

1.4 1.4 DOCUMENTATION AND ACCEPTANCE:

A. Software Programming & Documentation shall contain as a minimum:
   1. Detailed Graphical representation of all control algorithms for every piece of mechanical equipment controlled on the project, together with a glossary symbol library detailing the function of each graphical symbol. 'Line by line' computer program documentation is unacceptable.
   2. Detailed description of control sequences used to achieve the specified sequences.
   3. Software Graphical representation of the mechanical equipment hierarchy for the project including all equipment controlled by the BAS

B. Performance Verification Test and Acceptance.
   1. Upon completion of the installation, the Contractor shall start up the system and perform all necessary calibration, testing, and debugging operations. A Performance Verification Test will be performed by the Contractor.
   2. When the whole system performance is deemed satisfactory, the system parts will be accepted for beneficial use and placed under warranty. At this time, a "notice of completion" shall be issued by Williamson County and the warranty period shall start.

PART 2 - PRODUCTS HARDWARE

2.1 BACnetTM COMPATIBILITY:

A. The system must be fully BACnet compatible at the time of installation. This means that the system must use BACnet as the native communication protocol between distributed controllers communicating on the controller network (i.e. Field Bus) and must, as a minimum, support the following Objects and Application Services (Conformance Class 3):
   1. Objects > Binary Input
   2. Services Read property
   3. Binary Output Write property
   4. Binary Value I-Am

5. Analog Input I-Have
6. Analog Output Read Mutiple Property
7. Analog Value Write Multiple Property
8. Calendar Who-Has
9. Schedules Who-Is

B. The communication network between controllers must be EIA-485, at least 78.4 kbps, using either MS/TP or 156 kbps using ARCNET at the Data Link Layer. Systems that use proprietary protocol for the main controller field bus are not acceptable.

2.2 BUILDING SYSTEMS INTEGRATION:

A. Bi-directional Protocol Translator.
1. The Building Automation System (BAS) shall establish a seamless interconnection with other building, electrical and/or mechanical subsystems as well as other manufacturers control systems as specified below. These systems shall be controlled, monitored and graphically programmed through the Graphical User Interface (GUI) software of the BAS.
2. All system information specified in the I/O summary and related documents shall be available to the BAS. Read and write capability, as indicated, shall be provided to the mechanical and electrical equipment indicated and be available to the BAS system. No limits shall be placed by the manufacturer on the owner or BAS with regard to the access, transmission or modification of data provided from the equipment control system.
3. Full cooperation by the Original Equipment Manufacturer in this open protocol effort shall be a requirement for bidding this project. No exceptions shall be allowed and no bid shall be accepted which does not precisely define how the proposed equipment will comply with this section. OEM manufacturers shall bid either BACnetTM, facilitating interoperability between OEM electrical/mechanical sub-systems and the BAS.
4. Other equipment manufacturers shall provide this seamless integration through the use of a BACnet microprocessor based, bi-directional protocol translator (BPT) as specified below.
5. The BPT shall be a microprocessor based communication device designed to provide seamless, two-way translation between two or more standard or non-standard protocols.
6. The BPT shall be available for a variety of Data Link\Physical Layer configurations including PTP (point-to-point) via EIA-232, MS/TP via EIA-485, ARCNET over EIA- 485, and Ethernet using the IEEE 802.2 standard approved for BACnet.
7. The BPT shall provide full custom programmability of the data flowing between the networks using the same graphical programming as specified herein. The system shall have the ability to create custom building control strategies using global data between networks.

2.3 STANDALONE CONTROLLERS:

A. Input-Output Processing:
1. Digital outputs (each physical output) shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output. This is for general controllers only.
2. Universal inputs shall 0-5VDC - 10K Ohm maximum source impedance, 0-20mA – 24 VDC loop power 250 Ohm input impedance, Dry Contact - 0.5mA maximum current.
3. Analog electronic outputs shall be voltage mode 0-10VDC or current mode 4-20mA.
4. Space Zone sensor will provide one thermistor input (PreCon 10K @ 77F Curve II), one local set-point adjustment, one timed local override momentary push-button switch (switch must be parallel with setpoint adjust input Not the space input), and must have an occupancy LED indicator.
5. Temperature sensor Type will be PreCon 10K @ 77F Curve II, as manufactured by BAPI (Http//www.bapihvac.com).
6. Humidity transmitters will be +/- 2%.

7. Fan status indication: Where specified use current transformers, otherwise use a differential pressure switch (P32AC-2) with proper angled static probes inserted across the blower section.

2.4 UNITARY CONTROLLERS:

A. Unitary Controllers.
1. Each Unitary Controller shall be able to support various type of zone temperature sensors, such as temperature sensor only, temperature sensor with built-in local override switch, with set-point adjustment switch.
2. Each Unitary Controller for VAV application shall have a built-in air flow transducer for accurate air flow measurement in order to provide the Pressure Independent VAV operation.
3. Each Unitary Controller for VAV applications shall control a direct coupled electronic actuator. The actuator shall provide on-off/floating point control with a minimum of 35 in-lb of torque. The actuator shall be Honeywell Model ML6161 Tri-state/2pos 24vac, 90 second model. When reaching the damper or actuator end position, the actuator shall automatically stop.
4. Each Unitary Controller and Unitary Controller Interface shall have LED indication for visual status of communication, power, and all outputs.
5. In the event of a loss of communication with the Unitary Controller Interface, each Unitary Controller shall control from a standalone algorithm which maintains the assigned space temperature until communication with the Unitary Control Module Interface is restored.

2.5 STANDALONE CONTROLLERS:

A. General Purpose/Multiple Application Controllers.
1. Each General Purpose/Multiple Application Controller must be capable of standalone direct digital operation utilizing its own 32 bit processor, non-volatile flash memory, input/output, 12 bit A to D conversion, hardware clock/calendar and voltage transient and lightning protection devices. All non-volatile flash memory shall have a battery backup of at least five years Firmware revisions to the module should be able to be made from the local workstation, portable operator terminals or from remote locations over modems or LANs.
2. The General Purpose/Multiple Application Controllers shall be expandable to the specified I/O point requirements. Each controller shall accommodate multiple I/O Expander Modules via a designated expansion I/O bus port. These expander modules shall expand the total point capacity of each controller up to 192 points where specified. The controller, in conjunction with the expansion modules, shall act as one standalone controller.
3. All point data, algorithms and application software within a controller shall be custom programmable from the operator workstation.
4. Each General Purpose/Multiple Application Controller shall execute application programs, calculations, and commands via a 32 bit microcomputer resident in the controller. All operating parameters for application programs residing in each controller shall be stored in read/writable nonvolatile flash memory within the controller and will be able to upload/download to/from the operator workstation.
5. Each General Purpose/Multiple Application Controller shall reside on a BACnet communications bus and utilize native BACnet communications between all other controllers and devices on the network. Each controller shall include self-test diagnostics which allow the controller to automatically relay to the network controller any malfunctions or alarm conditions that exceed desired parameters as determined by programming input.
6. Each General Purpose/Multiple Application Controller shall contain both software and firmware to perform full DDC PID control loops.

7. Each General Purpose/Multiple Application Controller shall contain a serial port for the interface of maintenance personnel's portable computer. All network interrogation shall be possible through this port.
8. NO Application Specific controllers (with predefined templates, etc.) are to be used.
9. All controllers must allow changes to the logic without limitations, modification of memory logic blocks, adding points and algorithms.

2.6 FIELD HARDWARE/INSTRUMENTATION:

A. System to include DDC controllers. The controllers will be mounted and wired in a weather appropriate steel enclosure. The controller must have a minimum space perimeter of 3" between any terminal block and the enclosure wall. No controllers are to be mounted inside any unit housings.

2.7 SENSORS and MISCELLANEOUS DEVICES:

A. Temperature Sensors. All temperature sensors to be solid state electronic, factory-calibrated to within 0.5 degrees F, totally interchangeable. Wall sensors to be housed in tamperproof enclosures. Duct sensors to be electronically identical housing suitable for the application.

B. Sensor. Standard wall sensor shall use solid state sensor identical to DWC and shall be packaged in aesthetically pleasing enclosure. Sensor shall provide override function, warmer/cooler lever for setpoint adjustment and jack for plug-in of DWC for field adjustments. Override time shall be stored in controller and be adjustable on a zone-by-zone basis. Adjustment range for warmer/cooler lever shall also be stored in EEPROM on controller. All functions of DWC shall be available through wall sensor port. Furnish heavy duty metal guards for wall sensors in all corridors, gyms , locker rooms, cafeterias. Temperature sensors and humidity sensors shall be separate devices in separate enclosures.

C. Differential Pressure Switches (Air): Provide differential pressure switches across fans and filters for status indication. Differential pressure switches shall have an adjustable set-point from 0.05”w.c. to 2”w.c. with a switch differential that progressively increases from 0.02”w.c. at minimum to 0.8”w.c. at maximum. Switch shall be SPDT rated for 15A (non-inductive) at 277VAC.

D. Differential Pressure Switches (Liquid): Provide differential pressure switches across pumps and chillers to prove flow. Differential pressure switches shall have a 0-150 psig working differential pressure and have an adjustable setpoint from 4”w.c. to 43.5”w.c. on a fall and 5.5”w.c. to 45”w.c. on a rise. Liquid differential pressure switch enclosure shall carry a NEMA 4 rating. Switch shall be SPDT rated for 5A (inductive) at 125VAC.

E. Float Switches: Provide float switches in condensate drain pans as required by code. Float switches shall utilize a magnetically actuated dry reed switch. Float shall be constructed of seamless polypropylene. Switch shall be SPDT rated for 16A (non-inductive) at 120VAC.

F. Mixed Air Low Limit Controllers: Mixed air low limit controllers shall be manual reset, adjustable set-point with 20-foot element serpentined across the entering air face of center cooling coil. Control shall be responsive only to the lowest temperature along the element.

G. Static High Limit Controllers: Discharge static high limit controllers shall be provided on all HRU systems. When discharge static pressure exceeds setpoint, the supply fan shall be de-energized. Manual reset shall be required.

H. Pressure Transducers.

1. Static Pressure Transducers (Air): Provide static pressure transducers for monitoring supply duct static pressure. Static pressure transducers shall be 100% solid state and shall include glass on silicon, ultra stable capacitance sensors. Each static pressure transducer shall incorporate short circuit and reverse polarity protection. Transmitter output shall be either 0-10Vdc or 4-20mA. Static pressure transducers are to be provided in an enclosure that is suitable for duct mounting. The desired set-point is to be in the top 50% of the transmitter's operating range.
2. Differential Pressure Transducers (Air): Provide differential pressure transducers for monitoring air system and airflow measuring station differential pressures. Differential pressure transducers shall be 100% solid state and shall include glass on silicon, ultra stable capacitance sensors. Each differential pressure transducer shall incorporate short circuit and reverse polarity protection. Transducer output shall be either 0-10Vdc or4-20mA. Differential pressure transducers are to be provided in an enclosure that is suitable for duct mounting. The desired set-point is to be in the top 50% of the transducer's operating range.
3. Line Pressure Transducers (Liquid): Provide line pressure transducers for monitoring hydronic system line pressures. Pressure transducers shall be 100% solid state and shall include diffused piezoresistive silicon wafer type sensors. Transducer output shall be either 0-10Vdc or 4-20mA. Pressure transducers shall not require additional nulling valves. Pressure transducers are to be provided in a field mounted enclosure and all wetted parts shall be constructed from materials that are suitable for operation in the measured medium. The desired set-point is to be in the top 50% of the transducer's operating range.
4. Differential Pressure Transducers (Liquid): Provide differential pressure transducers for monitoring hydronic system differential pressure. Differential pressure transducers shall be 100% solid state and shall include dual diffuse piezoresistive silicon wafer type sensors. Transducer output shall be either 0-10Vdc or 4-20mA. Differential pressure transducers shall not require additional nulling valves. Differential pressure transducers are to be provided in a field mounted enclosure and all wetted parts shall be constructed from materials that are suitable for operation in the measured medium. The desired set-point is to be in the top 50% of the transducer's operating range.

I. Liquid Flow Meters: Provide insertion type flow meters for monitoring system hydronic system flow. Flow meters shall be 100% solid state and shall include paddle type non-magnetic, non-photoelectric sensors. Flow meters shall be provided with "hot tap" isolation valves and all accessories for bi-directional flow. Flow meter transmitter supply voltage to be 24VAC unregulated. Flow meter output shall have either a 4-20mA or pulse output that is linear with the flow rate.

J. Current Sensing Relays: Provide adjustable current switches for indication of equipment status. Amperage ratings shall be adjustable with the desired setpoint to be in the top 50% of the current relay's operating range. Current sensing relays shall incorporate trip indication LED's and shall be sized for proper operation with the equipment served.

K. Relative Humidity Sensors: Relative humidity sensors shall have an accuracy of +/- 3% from 5 to 95% RH. Output signal shall be either be 0-10Vdc or 4-20mA. Humidity transmitters shall be factory calibrated and require no field setting.

L. Duct/Well Sensors: Sensors for duct and water temperature sensing shall incorporate either RTD or Thermistor sensing devices. Sensing element accuracy shall be 0.1% over the sensor span or better. Where the element is being used for sensing mixed air or coil discharge temperatures, the element shall be of the averaging type. Averaging duct sensors shall utilize a sensing element that is 2 feet in length for each square foot of coil. Furnish multiple sensors wired in series/parallel arrangement for complete coverage. Where necessary utilize several temperature sensors and analog –inputs and average the temperature via software. Averaging sensors shall be installed in a serpentine manner uniformly across the coil cross section, with

radius clips at each bend of the sensor in the coil supporting the sensor. BAS contractor shall coordinate the mounting of all coil averaging sensors with the AHU manufacturer. Immersion sensors shall use matched 316 stainless steel bulb wells. All duct and immersion sensors shall be provided with conduit connection housings. Sensors shall be provided with adequate standoffs for insulation installation.

M. Selector Switches: Selector switches shall be 2 or 3-positon, knob or key type as required by the sequence of operation. Selector switches shall feature oil tight construction and be fitted with snap-fit contact blocks rated for 10A, 600VAC/DC operation. Labels shall be provided indicating switch position.

N. Pushbutton Switches: Pushbutton switches shall be either maintained or momentary as required by the sequence of operation. Pushbutton switches shall feature oil tight construction and be fitted with snap-fit contact blocks rated for 10A, 600VAC/DC operation. Labels shall be provided indicating switch function.

O. Pilot Lights: Pilot lights shall be furnished as required by the sequence of operation. Pilot lights shall utilize multi-colored dome lenses and replaceable LED lamps. Labels shall be provided to indicate light function

2.8 DAMPERS and ELECTRONIC DAMPER ACTUATORS:

A. Dampers. Furnish 5100 model parallel or opposed blade control dampers as manufactured by Vent Products. Blades to be 16 ga. *V*-reinforced galvanized steel. Welded frame to be Fasten E/Z press formed 14 ga. galvanized steel complete with fully adjustable linkage and control rods. Blades to be custom sized for maximum free area without blank-offs.

B. Electronic Damper Actuators.
1. Actuator shall be direct coupled (over the shaft), enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator-to-shaft clamp shall use a “V” bolt and “V” shaped, toothed cradle to attach to the damper shaft for maximum holding strength. Single bolt or set screw type fasteners are not acceptable.
2. Actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. End switches to deactivate the actuator at the end of rotation or magnetic clutch are not acceptable.
3. For power-failure/safety applications, a mechanical, spring return mechanism shall be used.
4. Actuators with spring return mechanisms shall be capable of either clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
5. Proportional actuators shall accept a 2–10VDC, 4–20mA signal, or be of the 2-point floating type and provide a 2–10VDC actuator position feedback signal.
6. All actuators shall have an external manual gear release (clutch) or manual crank to aid in installation and for allowing manual positioning when the actuator is not powered.
7. All actuators shall have an external direction of rotation switch to aid in installation and to allow proper control response.
8. Actuators shall be provided with a factory-mounted 3-foot electrical cable and conduit fitting to provide easy hook-up to an electrical junction box.
9. Actuators shall be listed under Underwriters Laboratories Standard 873 and Canadian Standards Association.

2.9 CONTROL VALVES:

A. Control Valves: Control valves shall be globe type constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Provide two way or three way pattern as shown on the plans. Valves with size up to and including 2-1/2" shall be "screwed". 3" and larger valves shall be “flanged” configuration. Valves larger than 4” shall be butterfly. Water

control valves shall be sized for a maximum pressure drop of 5.0 psig at rated flow (except as noted). . Two-way control valves shall exhibit equal percentage characteristics. Two-position control valves shall be line size. Ball valves are acceptable for floating or two-position operation where valve size is less than 1 inch.

B. Valve Actuators: Electronic valve actuators shall be suitable for direct-coupled mounting to the valve bonnet. Valve actuators shall be properly sized to provide sufficient torque to position the valve throughout its operating range. All valve actuators shall be spring return. Where butterfly valves are specified, double acting non-spring return actuators may be used. Unless otherwise stated, provide normally open valves for heating water applications and normally closed valves for chilled water applications.

PART 3 - PRODUCT SOFTWARE

3.1 GRAPHICS:

A. The Graphics shall make extensive use of color to communicate information related to set-points and comfort, and shall comply with the following:
   1. The Graphics software shall be displayed in 1024 by 768 pixels 24 bit True Color at the Williamson County Central Energy Management Computer.
   2. Floor plan maps shall show heating and cooling zones throughout the buildings in a range of colors, which provide a visual display of temperature relative to their respective set-points. The colors shall be updated dynamically as zones' comfort condition change. Locations of space sensors shall also be shown for each zone. Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. It shall also provide a current status of all I/O points being controlled and applicable to each piece of equipment including analog readouts in appropriate engineering units at appropriate locations on the graphic representation.
   3. The system shall utilize a contiguous band of colors, each corresponding to actual zone temperatures relative to the desired heating and cooling set-points. The ideal temperature shall be shown as a green color band. This color band shall normally correspond to the dead band between the onset of mechanical heating or cooling. Temperatures slightly warmer than ideal shall be shown in yellow, and even warmer temperature band shall be shown in orange. Temperatures slightly cooler than ideal shall be light blue, and eve cooler temperatures shall be shown as dark blue. All alarm colors shall be in red. The system shall be capable of utilizing the mouse operator interface device to change individual zone temperature bar and by pressing a button, and by moving the mouse cursor to an increased or decreased temperature set-point within that zone. The system shall also be capable of utilizing the mouse interface device or a conventional keyboard to change a numeric temperature set-point value instead of utilizing the graphic temperature bar. The floor plan graphic shall then be able to change colors on a zone by zone basis to reflect the actual temperature in each zone relative to the changed desired heating or cooling set-point. The system shall be capable of globally changing all set-points.
   4. Equipment operation schedules shall be definable for the entire system, area or individual equipment. For example, a user shall have the ability to define a single common occupancy schedule for every piece of equipment within a system or an area. Users with access to multiple systems shall have the ability to define a single common schedule, which affects multiple systems. Changes to the single schedule shall be made at this single point and shall automatically be passed to all equipment and individual controllers within the system without further user intervention. Exceptions to this single common schedule or additional occupancies shall be made at any area or equipment level. The schedule display for any piece of equipment shall clearly indicate every individual schedule, which affects equipment, as well as the net operating schedule, which shall

result from all contributing schedules. Users shall be able to define Schedule Groups, comprised of a user defined group of equipment that may be scattered throughout the facility and site. For example, the user shall be able to define a single Group Schedule to control all desire rooms on either a normal (day-to-day) or exception ('special Saturday working') basis.

3.2 STANDARD OPTIMUM START AND STOP SCHEDULES:

A. Williamson County shall provide optimum start and stop schedules for the facility. If not provided during submittal review, request from the A/E during integration.

3.3 GLOSSARY OF TECHNICAL TERMS:

A. **ARCNET Attached Resources Computer network**. ARCnet is a non-proprietary high speed peer to peer token passing Local Area Network (LAN) or transportation media. ARCnet can be used on twisted shielded cable networks, coaxial cable and other physical media.

B. **BACnet** A protocol for Building Automation and Control networks, an American National Standard, ANSI/ASHRAE 135-1995, designed for all building automation sub-systems and to promote interoperability between different system vendors. BACnet defines protocol communications and transport media.

C. **BACnet Device** Any device such as a sensor, controller or computer that is capable of some level of communication using the BACnet protocol.

D. **BACnet Object Generally** a reference to either a physical or virtual point with a set of associated properties. An example of an object would be a temperature sensor. Properties include current value, name, units, minimum, maximum, low alarm, high alarm, etc.

E. **BACnet Service Refers** to an Application Service such as the ability to read and write a point value. BACnet Application Services are currently arranged in Conformance Classes.

F. **Bridge** Typically, a bridge is a component of a local area network that connects two similar networks and may filter communications between those two networks.

G. **Conformance** Reference to the conformance classes described in the BACnet standard, conformance class describes a hierarchy of communication services or capabilities in a controls device. Class 3 has more services than class.

H. **Datalink Layer** Reference to one of the four structured layers of the BACnet protocol, the Datalink layer resides between the Physical and Network layers. The Datalink layers controls access to the Physical layer, i.e. adds final codes much like the U.S. Postal Service add a bar code, enabling a computer to sort by destination.

I. **EIA-232** Electronic Industries Association serial communication standard (formerly known as RS-232), uses +/-12 V signals over a 25 pin D type connector or 9 pin D type connector, easily located on the rear of your computer. Generally, EIA-232 communications run up to a maximum distance of 50 feet

J. **EIA-485** Electronic Industries Association serial communication standard (formerly known as RS-485), uses +/- 5 V signals over two or four wire multi-drop communication networks using transmitters and receivers. Generally, communications run over a maximum distance of 4000 feet.

K. **Ethernet** Ethernet is a high speed local area network (LAN) developed by the Digital Equipment Corporation and Xerox Corporation. Ethernet networks transmit data at speeds of up to 100M baud.

L. **Functional Profile** Functional Profiles define a minimum number of I/O points for a specified HVAC application that are exposed for interoperability with another manufacturer. For example, the LonMark Functional Profile for a VAV terminal box defines a couple of points that are common to all VAV applications - all other points are optional and at the discretion of the controls manufacturer.

M. **Gateway** A gateway provides a communications translation between two (fundamentally) different protocols. The media types may be the same or different. Examples of fundamentally different protocols are ASHRAE's BACnet and Echelon's LonWorks

N. **LAN** Local Area Network is a physical network designed to transfer data between computers or controlling devices in a limited geographical area.

O. **LonWorksTM** LonWorks is a protocol (not approved in the BACnet standard) developed by the Echelon Corporation. The Application layer in LonWorks is proprietary just like any other proprietary protocols.

P. **LonMarkTM** LonMark is a certification by the LonUsers Association that a device conforms to a functional profile and may be interoperable with other LonMark certified devices. LonMark devices use the LonWorks protocol.

Q. **LonUsers** Assoc. An association of LonWorks developers and implementers who collectively determine whether manufactures LonWorks implementations conform to the LonMark standard.

R. **MS/TP** Master Slave/Token Passing scheme operated over an EIA-485 communications network. Master controllers must be aware of other controllers (both Master and Slave) on the network and pass a token, entitling the recipient to initiate a BACnet message. Slave controllers only respond to master controllers.

S. **Native BACnetNative** BACnet means that the system manufacturer has implemented BACnet protocol communications between all devices residing on a physical network segment, versus a manufacturer that chooses to utilize a proprietary protocol and may offer some level of functionality through a BACnet gateway.

T. **Network Layer** Reference to one of the four structured layers in the BACnet protocol. The Network layer resides between the Datalink and Application layers. The Network layer is responsible for the logical routing of the BACnet message.

U. **Node** A node simply refers to any device that forms part of a communication network and has an associated address, much like a street number..

V. **Open Protocol** Open protocol describes a manufacturer who may be willing to release or assist a third party in developing an interface under certain conditions. Typically, the protocol remains proprietary to the manufacturer. The protocol is not necessarily in the public domain and is not an American standard like ASHRAE' BACnet.

W. **Peer to Peer** Peer to peer communications or status describes the ability of one controller device to communicate with another of equal status.

X. **PICS** Protocol Implementation Conformance Statement - a concise technical document identifying BACnet objects, services, conformance classes and other properties implemented by an automation system manufacturer.

Y. **Proprietary Protocol** A communications protocol that is never disclosed to the customer and remains the property of the designer or manufacturer, thus limiting the customer's choice of vendor for system expansion, service and integration with other building sub-systems.

Z. **Protocol** A set of rules and structure that governs how computer devices talk to one another.

AA. **PTP** Point-To-Point refers to serial communication between two devices locally or over a telephone modem. An example is connection of a hand held tool to a controller.

BB. **Repeater** A repeater, as the name belies, simply connects two or more segments of a communication network and reproduces the signal. This is necessary, because electronic signals attenuate over distance.

CC. **Router** A router connects two or more (possibly different) networks and filters messages between them. Networks may be physically different media types, such as twisted shielded cable and a fiber optic cable. The protocols used on the different networks are essentially the same.

DD. Token (Passing) See MS/TP, EE.

EE. **Unitary Controller** A controller designed with a specific application and single piece of HVAC equipment. An example is a pressure independent VAV terminal unit application.

FF. **WAN** Wide Area Network, similar to a LAN, connects an unlimited number of LANs together to form a WAN with no geographical limitations imposed by cable distances, etc.

3.4 BASIC SEQUENCE OF OPERATION PER MECHANICAL SYSTEM TYPE:

A. All units and systems to be controlled by Direct Digital Control system, monitored by Williamson County Energy Management System.

3.5 STANDARDS FOR SPACE TEMPERATURES AND HUMIDITY:

A. The Energy Management controlled space, which contain sensor set-point adjustments will be base controlled for heat 71 degrees F and cool 75 degrees F. The adjustments allowed will be +/- 3.0 degrees F, which will in-affect allow a range for the heating set-point to be 68- 75 degrees F with a 1F deadband and cooling set-point to be 71-79 degrees F with a 1F deadband , this range takes into account the dead-bands associated for electric heat or second stage cooling. Night setback set at 65 degrees F and setup at 85 degrees F. The set-point adjustment will be zero after hours for setup and setback, the set-point adjustment will only take effect during scheduled ON mode and override mode.

B. Mandatory for all space sensors to be calibrated using a current certified calibrated thermocouple type instrument. All sensors must be located near a return air vent and away from any heat inducing source such as, computers, monitors, lamps, coolers, etc. The sensor must not be blocked or covered by any other item other than it factory cover or standard protective or lock box cover, which are well vented. Where required a wired lock box cover, which is well vented will be used (no plastic lock box covers). The sensor must be well insulated from infiltration, between walls, or doorways and windows. The sensor must not be in direct contact from the sunlight.

C. The Energy Management controlled spaces, which are served by outside air units, a dew-point temperature of 53 degrees F - 57 degrees F or less is to be maintained. This will be achieved by cycling the compressor and gas heat or forcing the unit into hot gas reheat to maintain the space from over cooling.

D. Provide complete control systems operating with the following sequences:
   1. Cooling/Heating Units.
      a. Morning Start-up Optimum Run Mode: Start-up mode starts 30 minutes before occupied start times. This 30 minutes is in addition to any optimized starting logic. Unit Blowers to run continuously. Discharge air sensor for monitoring only.
      b. Occupied Mode: Coordinate start/stop times with Williamson County Energy Management Department. A Space sensor with a set-point adjust and pushbutton override and a space Humidity sensor will be monitored to logically control and maintain the standards for temperature and humidity control.
      c. Unoccupied and Night Setback Mode: Space set-points will automatically reset to maintain 60 degrees F + 3 degrees F dead-band Heating (60 degrees F – 63 degrees F), 85 degrees F – 3F dead-band Cooling (82 degrees F – 85 degrees F). The associated unit will cycle ON/OFF to achieve the set-point. Dehumidification is to take place during occupied mode, unoccupied mode and morning start-up.
      d. Load Rolling: Provide delay start for high electrical consumption loads to prevent simultaneous start-up of equipment. All equipment is to be stagger started as required to reduce demand changes. Alter start-up schedules as required. Provide load rolling rotationally adjusting Occupied space set-points and turning OFF equipment as required to meet user defined energy targets
      e. Dehumidification Control Units: During occupied and unoccupied period the humidity sensor shall cycle the compressor to dry the air. The space temperature shall control the heating coil to prevent overcooling.
   2. Cooling/Heating with Outside Air.
      a. Morning Start-up Optimum Run Mode: Start-up mode starts 30 minutes before occupied start times. This 30 minutes is in addition to any optimized starting logic. Unit Blowers to run continuously. Discharge air sensor for monitoring only. Outside air damper is closed, heat wheel and associated blowers are off.
      b. Occupied Mode: Coordinate start/stop times with Williamson County Energy Management Department. A Space sensor with a set-point adjust and pushbutton override and a space Humidity sensor will be monitored to logically control and maintain the standards for temperature and humidity control. Outside air dampers, heat wheel (if applicable) and associated fans shall start.
      c. Unoccupied and Night Setback Mode: Space set-points will automatically reset to maintain 60 degrees F + 3 degrees F dead-band Heating (60 degrees F – 63 degrees F), 85 degrees F – 3F dead-band Cooling (82 degrees F – 85 degrees F). The associated unit will cycle ON/OFF to achieve the set-point. Dehumidification is to take place during occupied mode, unoccupied mode and morning start-up.
      d. Load Rolling: Provide delay start for high electrical consumption loads to prevent simultaneous start-up of equipment. All equipment is to be stagger started as required to reduce demand changes. Alter start-up schedules as required. Provide load rolling rotationally adjusting Occupied space set-points and turning OFF equipment as required to meet user defined energy targets.
      e. Dehumidification Control Rooftop Units without outside air dampers: During occupied and unoccupied periods the humidity sensor shall cycle the compressor to dry the air. The space sensor shall control the hot gas reheat to prevent overcooling.
      f. Unit Ventilators.
         1) Provide start/stop control of unit to maintain schedule. Monitor outside air and discharge temperature and humidity from unit.

3.6 POINTS LIST:

A. See points list following this specification.

PART 4 - EXECUTION

4.1 FIELD SERVICES:

A. Prepare and start logic control system under provisions of this section.

B. Start-up and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

C. Provide the capability for off-site monitoring at Williamson County’s existing office and at the control contractor's local or main office. At a minimum, the control contractor’s off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for 1 year or as specified.

D. Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

4.2 TRAINING:

A. Provide application engineer to instruct owner in operation of systems and equipment.

B. Provide system operator’s training to include (but not limited to) such items as the following: modification of data displays, alarm and status descriptors, requesting data, execution of commands and request of logs. Provide this training to a minimum of 3 persons.

C. Provide training above as required, up to 40 hours as part of this contract at the owner’s discretion.

4.3 DEMONSTRATION:

A. Provide systems demonstration to the reasonable satisfaction of Owner.

B. Demonstrate complete operating system to owner's representative.

C. Provide certificate stating that control system has been tested

4.4 GENERAL INSTALLATION:

A. Install in accordance with manufacturer's instructions.

B. Install all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

4.5 LOCATION AND INSTALLATION OF COMPONENTS:

A. Locate and install components for easy accessibility; in general, mount 60 inches above floor with minimum 3'-0" clear access space in front of units. Obtain approval on locations from owner’s representative prior to installation.

B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections—sized to suit pipe diameter without restricting flow.

4.6 INTERLOCKING AND CONTROL WIRING:

A. Include all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 16 and all national, state and local electrical codes.

B. Include wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions.

C. Plenum-rated control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.

D. Include auxiliary pilot duty relays on motor starters as required for control function.

E. Include power for all control components from nearest electrical control panel or as indicated on the electrical drawings—coordinate with electrical contractor.

F. All control wiring in the mechanical, electrical, telephone and boiler rooms to be installed in raceways. All other wiring to be installed neatly and inconspicuously per local code requirements.

END OF SECTION 23 09 00

18465.01

SECTION 23 23 00

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 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Hot-Gas and Liquid Lines: 535 psig.

1.4 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: 1/4 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.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.8 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.

1.9 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07 72 00 "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Brazing Filler Metals: AWS A5.8.

D. 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-ong assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 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. 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.

D. 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.

E. 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. Reverse-flow option (for heat-pump applications).
7. End Connections: Socket, flare, or threaded union.

F. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Equalizer: External.
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
8. End Connections: Socket.
9. Throttling Range: Maximum 5 psig.
10. Working Pressure Rating: 500 psig.
11. Maximum Operating Temperature: 240 deg F.

G. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

H. 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.

I. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
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.

J. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

K. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 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:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.

3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. 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 joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. 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.

B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

C. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

D. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

E. 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.

F. 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.

G. 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.

H. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

I. Install receivers sized to accommodate pump-down charge.

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. Refer to Section 23 09 00 "Instrumentation and Control for HVAC" and Section 23 09 93 "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 Section 08 31 13 "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. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 23 05 53 "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 REFRIGERANT LINE INSULATION

A. Install 1” flexible elastomeric insulation on both the suction lines of split systems. Provide aluminum jacket on all insulated refrigerant lines installed in the parking garage and outside the building envelope.

3.5 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. 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.

D. 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.

3.6 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 23 05 29 "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.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI. 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.
2. 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.

3.8 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.

3.9 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 23 23 00

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SECTION 23 33 00

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. Manual volume dampers.
3. Fire dampers.
4. Turning vanes.
5. Remote damper operators (Concealed Regulators).
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts.
9. Duct accessory hardware.

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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

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/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a **No. 2** finish for concealed ducts and 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. 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. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Lloyd Industries, Inc.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff.
8. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 1000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 0.05-inch-thick, galvanized sheet steel, with welded corners or mechanically attached.

F. Blades: Multiple single-piece blades, off-center pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Aluminum.

K. Bearings: synthetic pivot bushings.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

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. Air Balance Inc.; a division of Mestek, Inc.
    b. McGill AirFlow LLC.
    c. Nailor Industries Inc.
    d. Pottorff.
    e. Ruskin Company.
    f. Trox USA Inc.
    g. Vent Products Company, Inc.
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:
    a. Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
    a. Multiple or single blade.
    b. Opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
    a. Oil-impregnated bronze or molded synthetic.
8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 FIRE DAMPERS

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. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff.
8. Prefco; Perfect Air Control, Inc.

9. Ruskin Company.
10. Vent Products Company, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2375-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours as indicated on the drawings.

E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: Refer to Detail on Drawings.
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.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.024-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.6 TURNING VANES

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. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. METALAIRE, Inc.
5. SEMCO Incorporated.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall.

2.7 REMOTE DAMPER OPERATORS

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. Pottorff.
2. Ventfabrics, Inc.

3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Cable: Steel.

D. Wall-Box Mounting: Recessed.

E. Wall-Box Cover-Plate Material: Stainless steel.

2.8 DUCT-MOUNTED ACCESS DOORS

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. American Warming and Ventilating; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Nailor Industries Inc.
7. Pottorff.

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-inchbutt 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: and two compression latches with outside and inside handles.
   d. Access Doors Larger Than 24 by 48 Inches: Continuous and three compression latches with outside and inside handles.

2.9 FLEXIBLE CONNECTORS

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. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 30 oz./sq. yd.
2. Tensile Strength: 500 lbf/inch in the warp and 500 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: 500 lbf/inch in the warp and 500 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.10 FLEXIBLE DUCTS

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. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct for Medium and High Pressure Systems: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 12-inch wg positive and 5-inch wg negative.
2. Maximum Air Velocity: 5500 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: R-6..

C. Insulated, Flexible Duct for Low Pressure Systems: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 6-inch wg positive and 4-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: R-6.

D. Insulated, Flexible Duct (Where all metal duct is required): UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 6-inch wg positive and 4-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-value: R-6.

E. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches, to suit duct size. Refer to Drawings for required type.

2.11 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 as required to afford complete control of the air flow in the various duct systems. 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.

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 and smoke dampers according to UL listing. Position dampers installed in concealed locations such as chases and walls, or above hard ceilings, to allow access to actuators and smoke detectors through the minimum number of access panels.

H. Connect ducts to duct silencers rigidly.

I. 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. Downstream from control dampers, backdraft dampers, and equipment.
5. 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.
6. Control devices requiring inspection.
7. Elsewhere as indicated.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 8 inches.
2. Two-Hand Access: 12 by 12 inches.
3. Head and Hand Access: 18 by 14 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.

K. Label access doors according to Section 23 05 53 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. Connect terminal units to supply ducts directly or with maximum 24-inch lengths of flexible duct as detailed on the drawings. Do not use flexible ducts to change directions.

N. Connect diffusers or light troffer boots to ducts directly or with maximum 36-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where required for testing and balancing purposes.

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 23 33 00

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SECTION 23 37 13

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. All air distribution devices as scheduled on the drawings.

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.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Diffuser, Grilles and Registers:

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. METALAIRE, Inc.
   b. Nailor Industries Inc.
   c. Price Industries.
   d. Titus.

2.2 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 23 37 13

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SECTION 23 81 23

COMPUTER-ROOM AIR-CONDITIONERS, FLOOR-MOUNTED UNITS

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. These specifications describe requirements for a Mission Critical Cooling system. The system shall be designed to control temperature and humidity conditions in rooms containing electronic equipment, with good insulation and vapor barrier. The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements of the room.

B. The Mission Critical Cooling system shall be a Liebert self-contained, factory-assembled unit with downflow air delivery. The system shall have a capacity as scheduled. The system cooling capacity shall be factory-certified per ASHRAE127-2007.

1.3 DEFINITIONS

A. COP: Coefficient of performance.

B. EER: Energy efficiency ratio.

C. SCR: Silicon controlled rectifier.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include material descriptions, dimensions of individual components and profiles, and finishes for computer-room air-conditioning units.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For computer-room air conditioners.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment 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. Color Samples: For unit cabinet and discharge grille for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from installers of the items involved.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For computer-room air conditioners 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. Filters: Two set(s) of filters for each unit.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of computer-room air conditioners that fail in materials or workmanship within specified warranty period.

   1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
   2. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Liebert; a brand of Vertiv.

2.2 PRODUCT REQUIREMENTS

A. Frame: The frame shall be MIG welded, formed sheet metal. It shall be protected against corrosion using the autophoretic coating process. The frame shall be capable of being separated into three parts in the field to accommodate rigging through small spaces.

B. Exterior Panels: The exterior panels shall be insulated with a minimum 1 in., 1.5 lb. density fiber insulation. The main front panel shall have captive 1/4 turn fasteners. The main unit color shall be beige or standard color selected by architect..
   1. Double-Skin Panels: The exterior panels shall be internally lined with 20 gauge sheet metal, sandwiching the insulation between the panels, for easy cleaning.

C. Filters: The filter chamber shall be located within the cabinet, and filters shall be removable from the top of the unit. Filters shall be arranged in a V-bank configuration to minimize air pressure drop.
   1. Filters shall be deep pleated 4" filters with an ASHRAE 52.2 MERV11 rating.
   2. Two extra set(s) of filters shall be provided per system.

D. Fan Section:
   1. Electronically Commutated (EC) Fan
      a. The fans shall be plug/plenum type, single inlet and shall be dynamically balanced. The drive package shall be direct drive, electronically commutated and variable speed. The fans shall be located to draw air over the A-frame coil to ensure even air distribution and maximum coil performance. EC fans shall be available on downflow models, and fans may be lowered into a raised floor with a minimum height of 24". EC fans may operate within the Liebert DS cabinet, instead of under the floor.
      b. EC fans shall be available on upflow models and fans shall operate outside the unit in a factory-provided plenum with a minimum height of 24".
         1) DS028, DS035 and DS042 fan motor(s) shall be nominal 3.7hp each with a maximum operating speed of 1230 rpm; quantity, 1. Liebert Econ-O-Coil gets a 5.4hp fan for 380–480V (maximum 1370 rpm).
         2) DS053, DS070 and DS077 fan motors shall be nominal 4.0hp each with a maximum operating speed of 1520 rpm; quantity, 2.
         3) DS105 fan motors shall be nominal 3.4hp each, with a maximum operating speed of 1700 rpm; quantity, 3. (Power rating for 380–480V is 3.4hp; for 200–240V power is 3.6hp.)

E. Reheat: The environmental control unit shall include a factory-installed reheat to control temperature during dehumidification.
   1. SCR Electric Reheat
      a. The electric reheat coils shall be low watt density, 304/304 stainless steel fin tubular construction, protected by thermal safety switches, controlled by multiple pulses to achieve tight temperature control. The reheat elements shall be removable from the front of the cabinet.
   2. Dual Refrigeration System
      a. Each unit shall include two (2) independent refrigeration circuits and shall include hot gas mufflers (semi-hermetic compressors units only), liquid line filter dryers, refrigerant sight glass with moisture indicator, externally equalized expansion valves and liquid line solenoid valves. Compressors shall be located outside the airstream and shall be removable and serviceable from the front of the unit.
   3. Digital Scroll Compressors
      a. The compressor shall be scroll-type with a variable capacity operation capability. The compressor solenoid valve shall unload the compressor and allow for variable capacity operation. The compressor shall be suction gas cooled motor, vibration isolators, thermal overloads, automatic reset high-pressure switch with lockout after three failures, rotalock service valves, pump down low pressure transducer, suction line strainer and a maximum operating speed of 3500 rpm. Consult factory for 575V availability.
   4. Evaporator Coil
      a. The evaporator coil shall be A-frame design with offset orientation and three rows deep. It shall be constructed of rifled copper tubes and aluminum fins and shall have a maximum face velocity of 450 ft. per minute. A stainless steel condensate drain pan shall be provided.
   5. Polymeric Coating
      a. The coil shall be coated with a high performance polymeric coating process to provide corrosion resistance within 2 to 12 pH range.
   6. R-407C Refrigerant

a. The system shall be designed for use with R-407C refrigerant, which meets the EPA clean air act for phase-out of HCFC refrigerants.

2.3 CONTROLS

A. LIEBERT iCOM® MICROPROCESSOR CONTROL WITH 9-INCH COLOR TOUCHSCREEN

1. The Liebert iCOM shall be microprocessor-based with a 9" color touchscreen display and shall be mounted in an ergonomic, aesthetically pleasing housing. The display and housing shall be viewable while the front panel is open or closed. The controls shall be menu-driven. The system shall display user menus for active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in percentage of each function, date and time), total run hours, various sensors, display setup and service contacts. A password shall be required to make system changes. Service menus shall include setpoints, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, options setup, system/network setup, auxiliary boards and diagnostics/service mode.
   a. Password Protection - The Liebert iCOM shall contain two unique passwords to protect against unauthorized changes. An auto hide/show feature shall allow the user to see applicable information based on the login used.
   b. Unit Backup and Restore - The user shall be able to create safe copies of important control parameters. The Liebert iCOM shall have the capacity for the user to automatically backup unit configuration settings to internal memory or USB storage drive. Configuration settings may be transferred to another unit for a more streamlined unit startup.
   c. Parameter Download - The Liebert iCOM shall enable the user to download a report that lists parameter names, factory default settings and user programmed settings in .csv format for remote reference.
   d. Parameter Search - The Liebert iCOM shall have search fields for efficient navigation and parameter lookup.
   e. Setup Wizards - The Liebert iCOM shall contain step-by-step tutorials or wizards to provide easy setup of the control.
   f. Context-Sensitive Help - The Liebert iCOM shall have an onboard help database. The database shall provide context-sensitive help to assist with setup and navigation of the menus.
   g. Display Setup - The user shall be able to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, backlight timer and the hide/show of certain readouts shall be configurable through the display.
   h. Additional Readouts - The display shall enable the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free-cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.
   i. Status LED's - The Liebert iCOM shall show the unit's operating status using an integral LED. The LED shall indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is On, Off or in standby status.
   j. Event Log - The Liebert iCOM shall automatically store the last 400 unit-only events (messages, warnings, and alarms).
   k. Service Contact Information - The Liebert iCOM shall be able to store the local service or sales contact information.
   l. Upgradeable - Liebert iCOM upgrades shall be performed through a USB connection.
   m. Timers/Sleep Mode – The menus shall allow various customer settings for turning the unit On or Off.

n. Menu Layout - The menus shall be divided into two main menus: User and Service. The User screen shall contain the menus to access parameters required for basic unit control and setup. The Service screen shall be designed for service personnel and shall provide access to advanced control setup features and diagnostic information.
o. Sensor Calibration - The menus shall allow unit sensors to be calibrated with external sensors.
p. Maintenance/Wellness Settings - The menus shall allow reporting of potential component problems before they occur.
q. Options Setup - The menus shall provide operation settings for the installed components.
r. Auxiliary Boards - The menus shall allow setup of optional expansion boards.
s. Various Sensors: The menus shall allow setup and display of optional custom sensors. The control shall include four customer accessible analog inputs for field-supplied sensors. The analog inputs shall accept a 4 to 20mA signal. The user shall be able to change the input to 0 to 5VDC or 0 to 10VDC. The gains for each analog input shall be programmable from the front display. The analog inputs shall be able to be monitored from the front display.
t. Diagnostics/Service Mode - The Liebert iCOM control shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as On or Off at the front display. Control outputs shall be able to be turned On or Off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.

B. Alarms
1. All unit alarms shall be annunciated through both audio and visual cues, clearly displayed on the screen, automatically recorded in the event log and communicated to the customers Building Management System/Building Automation System. The Liebert iCOM control shall activate an audible and visual alarm in event of any of the following conditions:
a. High Temperature
b. Low Temperature
c. High Humidity
d. Low Humidity
e. EC Fan Fault
f. Change Filters
g. Loss of Air Flow
h. Loss of Power
i. Compressor Overload (Optional)
j. High Head Pressure
k. Low Suction Pressure
l. Custom Alarms
2. Custom alarm inputs shall be provided to indicate facility-specific events. Custom alarms can be identified with programmable labels. Frequently used alarm inputs include:
a. Leak Under Floor
b. Smoke Detected
c. Standby Unit On
3. Each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm and programmed for a time delay of 0 to 255 seconds.

C. LIEBERT ICOM® CONTROL METHODS AND OPTIONS
1. The Liebert iCOM shall be factory-set to allow precise monitoring and control of the condition of the air entering and leaving the unit. This control shall include predictive methods to control air flow and cooling capacity based control sensors installed. Proportional and Tunable PID shall also be user-selectable options.

2. Controlling Sensor Options: Liebert iCOM shall be flexible in the sense that it shall allow for controlling the capacity and fan from multiple different sensor selections. The sensor selections shall be:
    a. Cooling Capacity
        1) Supply
        2) Remote
        3) Return
    b. Fan Speed
        1) Supply
        2) Remote
        3) Return
        4) Manual (for diagnostic or to receive a signal from the BMS through the Liebert remote monitoring devices or analog input)
        5) Static Pressure
3. Temperature Compensation
    a. The Liebert iCOM shall be able to adjust the capacity output based on supply and return temperature conditions to meet SLA guidelines while operating to highest efficiency.
4. Humidity Control
    a. Dew point and relative humidity control methods shall be available (based on user preference) for humidity control within the conditioned space.

D. MULTI-UNIT COORDINATION
1. Liebert iCOM teamwork shall save energy by preventing multiple units in an area from operating in opposing modes. Teamwork allows the control to optimize a group of connected cooling units equipped with Liebert iCOM using the U2U (Unit-to-Unit) network. There shall be three modes of teamwork operation:
    a. Teamwork Mode 1: Is best in small rooms with balanced heat loads. The controlling temperature and humidity sensor readings of all units in operation (fan On) are collected to be used for an average or worst-case sensor reading (user-selectable). The master unit shall send the operating requirements to all operating units in the group. The control band (temperature, fan and humidity) is divided and shared among the units in the group.
    b. Teamwork Mode 2: The Liebert iCOM calculates the worse-case demand for heating, cooling humidification and dehumidification. Based on the greatest demand within the group, each unit operates independently, meaning that the unit may respond to the thermal load and humidity conditions based on the unit's controlling sensors.
    c. Teamwork Mode 3 - Optimized Aisle: May be employed in large and small rooms with varying heat loads. Optimized Aisle is the most efficient teamwork mode that allows the unit to match cooling capacity with heat load. In the Optimized Aisle mode, the fans operate in parallel. Fans can be controlled exclusively by remote temperature or using static pressure with a secondary remote temperature sensor(s) as an override to ensure that the inlet rack temperature is being met. Cooling (Compressors or Economizer) is controlled through unit supply air conditions. Liebert iCOM calculates the average or worst-case sensor reading (user-selectable) for heating, cooling humidification and dehumidification. Based on the demand within the group, units will be allowed to operate within that mode until room conditions are satisfied.

E. STANDBY LEAD-LAG
1. The Liebert iCOM® shall allow scheduled rotation to keep equal run time on units and provide automated emergency rotation of operating and standby units.

F. WIRED SUPPLY SENSOR

1. Each Liebert iCOM shall have one factory-supplied and connected supply air sensor that may be used as a controlling sensor or reference. When multiple sensors are applied for control purposes, the user shall be able to control based on a maximum or average temperature reading.

G. VIRTUAL MASTER
1. As part of the robust architecture of the Liebert iCOM control, it shall allow for a virtual master that coordinates operation. The Virtual Master function shall provide smooth control operation if the group's communication is compromised. When the lead unit, which is in charge of component staging in teamwork, unit staging and standby rotation, becomes disconnected from the network, the Liebert iCOM shall automatically assign a virtual master. The virtual master shall assume the same responsibilities as the master until communication is restored.

H. VIRTUAL BACK-DRAFT DAMPER
1. The Liebert iCOM shall allow the use of a virtual back-draft damper, eliminating the need for a mechanical damper. This shall allow the fans to spin slower (15% or less) to act as a damper.

I. COMPRESSOR SHORT CYCLE CONTROL
1. To help maximize the life of the compressor(s), there shall be start-to-next start delay for each single compressor. The control shall monitor the number of compressor starts in an hour. If the compressor starts more than 10 times in 60 minutes, the local display and remote monitoring shall notify the user through a Compressor 1 or 2 Short Cycle event.

J. LIEBERT MC™
1. Units may be matched to a premium efficiency condenser control with enhanced monitoring, alarming and diagnostics. The condenser control shall have an automated, low-noise mode and fan reversal for cleaning mode.

K. SYSTEM AUTO RESTART
1. The auto restart feature shall automatically restart the system after a power failure. Time delay shall be programmable. An optional capacitive buffer may be provided for continuous control operation through a power failure.

L. SEQUENTIAL LOAD ACTIVATION
1. On initial startup or restart after power failure, each operational load shall be sequenced with a minimum delay of one second to minimize total inrush current.

M. Low-Pressure Monitoring
1. Units shall ship standard with low-pressure transducers for monitoring individual compressor suction pressure. If the pressure falls due to loss of charge or other mechanical cause, the corresponding circuit shall shut down to prevent equipment damage. The user shall be notified of the low-pressure condition through the local display and remote monitoring.

N. Winter Start Time Delay—Air-Cooled Models
1. An adjustable software timer shall be provided to assist with compressor starting during cold weather. When the compressor starts, the low-pressure input shall be ignored for the period set in the user-adjustable timer. Once the time period has elapsed after the compressor start, the low-pressure input should remain in the normal state. If the low-pressure input does not remain in the normal state when the time delay has elapsed, the circuit shall lock out on low pressure. The low-pressure alarm shall be announced on the local display and communicated to remote monitoring systems.

O. Advanced Freeze Protection
   1. Units shall ship standard with advanced freeze protection enabled. The advanced freeze protection shall monitor the pressure of each circuit using a transducer. The control shall interact with the fan and compressor to prevent the unit coil from freezing if circuit suction pressure drops. If a freeze condition is detected, the user shall be notified through the local display and remote monitoring systems.

P. Advanced High-Pressure Protection—Water/Glycol-Cooled models with Digital Scroll Compressors
   1. When the compressor is initially activated, the system shall be monitored for high pressure. When high pressure is detected, the control shall alter the compressor operation to reduce the system discharge pressure, preventing circuit shut down. If the unit is unsuccessful in correcting the problem through this interaction, an alarm shall occur and the affected compressor shall be immediately locked off. The control shall re-enable the compressor when the pressure returns to a safe level.

Q. Refrigerant Pressure Transducer Failure
   1. The control shall monitor the high-side and low-side refrigerant pressure transducers. If the control senses the transducer has failed, has been disconnected, has shorted or the reading has gone out of range, the user shall be notified through an event on the local display and remote monitoring. The corresponding circuit that the failure has occurred on shall be disabled to prevent unit damage.

R. Oil Return Protection
   1. The control shall monitor compressor operation and staging to ensure that liquid and hot gas velocity are maintained for proper oil return to the compressor.

S. Digital Scroll High-Temperature Protection
   1. The control shall monitor digital scroll temperature during unit operation. A compressor temperature limit shall be imposed to help prevent damage to the compressor. If the temperature reaches the maximum temperature limit, the compressor shall be locked out and an alarm shall be annunciated on the local display and through monitoring. After the initial lockout, the control shall continue to monitor compressor temperature during the off-cycle and re-enable the circuit once a safe operating temperature is reached. The control shall store the number of high-temperature trips. The number of trips shall be accessible through the local display.

T. Digital Scroll Sensor Failure
   1. The control shall monitor the status of the digital scroll sensor(s). If the control senses that the thermistor is disconnected, shorted or the reading goes out of range, the user shall be notified through an event on the local display and remote monitoring.

U. Compressor Sequencing
   1. A user-selectable compressor sequencing parameter shall be provided and shall be accessible through the local display. This sequencing parameter shall present the user with three choices:
   2. Always use Compressor 1 as the lead compressor.
   3. Always use Compressor 2 as the lead compressor.
   4. Auto: The unit shall automatically stage compressors to keep each unit’s run time within 8 hours of the other’s run time.
      a. **First priority**: If the safety timings are acceptable for only one compressor, then it is the next to be started/stopped.
      b. **Second priority**: If both compressors are Off: The compressor with fewer working hours is the next to start.
      c. **Third priority**: If both compressors are in operation: the compressor that has been operating longer since the last start is the next to be stopped.

V. Compressor High- and Low-Temperature Limit Protection
1. The control shall monitor the return air to ensure that the compressor(s) are operated within the manufacturer's defined window of operation. If the return air temperature deviates from the manufacturer's window of operation, the Liebert iCOM shall automatically adjust to prevent damage to the cooling unit or reduction in its reliability.

W. Compressor Run time Monitoring
1. The control shall log these compressor statistics:
   a. Number of compressor starts
   b. Run hours
   c. Average run time
   d. Starts per day
   e. Starts per day worst
   f. Number of high-pressure alarms
   g. Operating phase in which the high-pressure alarm occurred
   h. Number of low-pressure alarms
   i. Operating phase in which the low-pressure alarm occurred
   j. Number of compressor overloads
   k. Number of high-temperature alarms (scroll compressors)
2. The user shall have the ability to monitor compressor operating temperature and pressure from the local display to be used as a diagnostic tool.

X. Manual Compressor Disablement
1. The user shall have the ability to disable compressor operation using a set of either normally open or normally closed dry contacts tied directly to the control or through remote monitoring. An additional enable/disable feature shall be provided to allow the user to permanently disable an individual compressor circuit for maintenance using the local display.

Y. Manual Compressor Operation
1. The user shall be able to operate each compressor(s) manually from the local display. The user shall be able to energize refrigeration components including liquid line solenoid valves, compressor contactors, electronic expansion valves and adjust capacity for troubleshooting or repair. The control shall monitor the compressor during manual operation and shall shut the compressor down if needed to prevent electrical or mechanical damage.

Z. Flooded Start Protection
1. The control shall isolate each compressor through a dedicated circuit liquid line solenoid valve and/or electronic expansion valve. These devices, combined with a spring-closed discharge check valve and compressor crankcase heater (air-cooled models), shall help ensure refrigerant does not migrate/carry oil out of the compressor case during the off cycle.

AA. Compressor Dehumidification
1. The control shall permit the user to specify which compressor is used for dehumidification. The choices shall be 1st compressor, 2nd compressor, 1 or 2, or BOTH.

2.4 MISCELLANEOUS OPTIONS

A. Locking Disconnect Switch
1. The manual disconnect switch shall be mounted in the high-voltage section of the electrical panel. The switch shall be accessible from the outside of the unit with the door

closed and shall prevent access to the high-voltage electrical components until switched to the Off position.

B. High Temperature Sensor
1. The firestat shall be factory-installed in the unit and shall be factory-set to 125ºF . It shall immediately shut down the environmental control system when activated. The sensor shall be mounted with the sensing element in the return air.

C. Smoke Sensor
1. The smoke sensor shall immediately shut down the environmental control system and activate the alarm system when activated. The smoke sensor shall be mounted in the electrical panel with the sensing element in the return air compartment. The smoke sensor is not intended to function as or replace any room smoke detection system that may be required by local or national codes. The smoke sensor shall include a supervision contact closure.

D. Condensate Pump, Dual Float
1. The condensate pump shall have a minimum capacity of 145 GPH at 20 ft. head. It shall be complete with integral dual-float switches, pump-and-motor assembly and reservoir. The secondary float shall send a signal to the local alarm and shall shut down the unit upon high water condition.

E. REMOTE MONITORING
1. A factory-installed communication card shall be provided for monitoring and/or control. The communication card shall be capable of connecting to Building Management System/Building Automation System using the following protocols:
a. BACnet IP—BACnet over Internet Protocol
b. BACnet MSTP—BACnet Master-Slave/Token-Passing (MSTP) communications protocol over a RS-485 serial network (also known as BACnet MSTP RS-485)

F. POWER MONITORING
1. The unit shall be equipped with factory-programmed/installed power meters to monitor power characteristics for either individual components or the total unit. These meters shall allow the user to monitor meter connection status, input undervoltage, input RMS voltage leg-to-leg and leg-to-ground, input current for each phase, energy consumption in kilowatt hours and instantaneous power in watts. In multi-unit applications, a phase loss protection routine shall place a unit into standby mode in the event.

G. Air-Cooled Systems
1. The indoor evaporator unit shall include refrigerant piping, with a factory holding charge of nitrogen. The hot-gas and liquid lines shall be spun shut and shall include a factory-installed Schrader valve. Field-relief of the Schrader valve shall indicate a leak-free system.
2. Air-Cooled Condenser
a. The Liebert-manufactured outdoor air-cooled condenser shall be the low profile, multiple direct drive, propeller fan type. The condenser shall balance the heat rejection of the compressor at 105°F ambient. The condenser shall be constructed of aluminum and contain a copper tube, aluminum fin coil arranged for vertical air discharge.
3. Fan Speed Control
a. The winter control system for the air-cooled condenser shall be Liebert Fan Speed Control. The variable speed motor shall operate from 0 to 230 volts single phase, 10 to 1050 RPM. It shall be designed with ball bearings, permanent lubrication, internal overload protection, 40°C rise at full speed, 65°C rise at 10 RPM. The control system shall be complete with transducers, thermostats and electrical

control circuit, factory prepackaged in the integral condenser control box. The transducer shall automatically sense the highest head pressure of either operating compressor and control the variable speed fan on the air-cooled condenser to properly maintain the head pressure. The Liebert Fan Speed Control system shall provide positive startup and operation in ambient temperatures as low as -20°F (-28.9°C). The air-cooled condenser shall have a ____ volt, ____ ph ____ Hz power supply.

1) Liebert Lee-Temp System
   a) The winter control system for the air-cooled condenser shall be Liebert Lee-Temp. The Liebert Lee-Temp system shall allow startup and positive head pressure control with ambient temperatures as low as -30°F (-34.4°C). The Liebert Lee-Temp package shall include the following components for each refrigeration circuit: insulated receiver, pressure relief valve, head pressure three-way control valve and rotalock valve for isolating the refrigerant charge. The Liebert Lee-Temp receiver shall be factory-insulated and mounted ready for the field-connection to the air-cooled condenser. The Liebert Lee-Temp heater shall require a separate power supply.
2) Condenser Disconnect Switch—
   a) A disconnect switch shall be factory-mounted and wired to the condenser control panel, accessible from the exterior.

H. Liebert Liqui-tect® Sensors
1. Provide 4 solid state water sensors under the raised floor.

I. Floor Stand
1. The floor stand shall be constructed of a welded steel frame. The floor stand shall have adjustable legs with vibration isolation pads. The floor stand shall be 18 inches high (coordinate with raised floor manufacturer).

J. Return Air Plenum for Downflow Units
1. The air plenum shall be constructed of 20 gauge steel, powder coated to match unit color. The plenum shall be 18" high. A door shall be included in the front of the plenum to enable front filter access. Air shall enter the plenum from the top.

K. Humidifier
1. A humidifier shall be factory-installed inside the unit. Bypass air slots shall be included to enable moisture to be absorbed into the air stream. The humidifier shall be removable from the front of the cabinet.
2. Initial installation of unit shall not utilize the humidifier. Provide unit with humidifier disabled for future use.
3. Infrared Humidifier
   a. The humidifier shall be of the infrared type, consisting of high-intensity quartz lamps mounted above and out of the water supply. The humidifier pan shall be stainless steel and arranged to be removable without disconnecting high-voltage electrical connections. The complete humidifier section shall be pre-piped, ready for field connection to the water supply. The humidifier shall be equipped with an automatic water supply system and shall have an adjustable water-overfeed to prevent mineral precipitation. A high-water detector shall shut down the humidifier to prevent overflowing. A factory-provided air-gap shall prevent backflow of the humidifier supply water.

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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 piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where computer-room air conditioners will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Layout and install computer-room air conditioners and suspension system coordinated with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Install computer-room air conditioners coordinated with computer-room access flooring Installer.

C. Install computer-room air conditioners level and plumb, maintaining manufacturer's recommended clearances.

D. Computer-Room Air-Conditioner Mounting: Install using elastomeric mounts.

1. Minimum Deflection: 1 inch.

E. Air-Cooled Refrigerant Condenser Mounting: Install using elastomeric mounts.

1. Minimum Deflection: 1 inch.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other heating, ventilating, and air-conditioning Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to computer-room air conditioners, allow space for service and maintenance.

C. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping." Provide shutoff valves and piping.

D. Electrical Wiring: Install and connect electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer’s electrical connection diagram submittal to electrical contractor.

E. Piping Connections: Install and connect devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer’s piping connection diagram submittal to piping contractor.

3.4 FIELD QUALITY CONTROL

A. Start Thermal Management units in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements. These specifications shall describe requirements for a computer room environmental control system. The system shall be designed to maintain temperature and humidity conditions in the rooms containing electronic equipment.
   1. The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

   1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
   2. After installing computer-room air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Computer-room air conditioners will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

G. After startup service and performance test, change filters.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain computer-room air conditioners.

END OF SECTION 23 81 23

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SECTION 26 05 00

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 01 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.
6. Selective electrical demolition.

1.3 DEFINITIONS

A. "Furnish, Provide, Install": Whenever the words "furnish", "provide", "furnish and install," "provide and install', and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Materials: Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. "Shall": The use of the word "shall" conveys a mandatory condition to the contract.

D. "Section": "This section" always refers to the section in which the statement occurs.

E. "Project": "The project" includes all work in progress during the construction period.

F. Multiple Items: In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.4 ELECTRICAL LINES:

A. General: In general, the electrical lines to be installed under these Specifications shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards as to complete the work in a neat and satisfactorily workable manner. The following is a general outline concerning the running of electrical lines and is to be excepted where the drawings or conditions at the building necessitate deviating from these standards.

B. General Construction: The Contractor shall thoroughly acquaint himself with the details of the construction and finishes before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details. Place all inserts in masonry walls while they are under construction. All concealed lines shall be installed as required by the pace of the general construction to precede that general construction.

C. Field Conditions: The electrical Drawings do not give exact details as to elevations of electrical lines, exact locations, etc., and do not show all the offsets, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the architectural and structural conditions, to avoid all obstruction, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation.

D. Locations of Electrical Devices: The electrical Drawings show diagrammatically the locations of the various electrical outlets and apparatus and the method of circuiting and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general Drawings and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with other sections, and in all cases shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in location of any outlet or apparatus before installation (within 10 feet of location shown on drawings) or after installation if an obvious conflict exists, without additional cost to the Owner.

E. Space Requirements: The Contractor shall be responsible for the proper fitting of his material and apparatus into the space. Should the particular equipment that any bidder proposes to install require other space conditions than those indicated on the drawings, he shall arrange for such space with the Architect before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such necessary changes at his (the Contractor's) own expense.

F. Working Drawings: The Contractor shall submit scale working drawings of all his apparatus and equipment which in any way varies from these Specifications and Drawings. The Architect shall check these variations from the Specifications and Drawings before the work is started. Before the work proceeds, the contractor shall correct any interference with the structural conditions.

G. Order of Precedence: Order of precedence shall be observed in laying-out the conduit in order to fit the material into the space above the ceiling and in the chases and walls. The installation shall be coordinated with the work of all other trades. The following order shall govern:

1. Items affecting the visual appearance of the inside of the building such as lighting fixtures, outlets, panelboards, etc. Coordinate all items to avoid conflicts at the site.
2. Lines requiring grade to function such as sewers.
3. Large ducts and pipes with critical clearances.
4. Conduit, water lines, and other lines whose routing is not critical and whose function bends and offsets would not impair.

H. Equipment Connections: Conduits serving outlets on items of equipment shall be run in the most appropriate manner. Where the equipment has built-in chases, the lines shall be contained therein. Where the equipment is of the open type, the lines shall be run as close as possible to the underside of the top and in a neat and inconspicuous manner.

I. Exceptions and Inconsistencies: Exceptions and inconsistencies in Drawings and Specifications shall be brought to the Architect's attention before the contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus, material, or equipment.

J. Intent of Drawings and Specifications: The Contractor shall distinctly understand that the work described herein and shown on the accompanying drawings shall result in a finished and working job, and any item required to accomplish this intent shall be included whether specifically mentioned or not.

K. Examination of Drawings and Specifications: Each bidder shall examine the Drawings and Specifications for the General Construction. If these documents show any item requiring work under Division 26 and that work is not indicated on the respective Electrical drawings, he shall notify the Architect in sufficient time to clarify before bidding. If no notification is received, the Contractor is assumed to require no clarification, and shall install the work as indicated on the General Drawings in accordance with the Specifications.

1.5 DIMENSIONS:

A. General: Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings. Any difference that may be found shall be submitted to the Architect for consideration before proceeding with the work.

1.6 INSPECTION OF SITE:

A. General: The accompanying Drawings do not indicate completely the existing electrical installations. The bidders for the work under these sections of the Specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.7 ELECTRICAL WIRING:

A. Description: All electric wiring of every character, both for power supply, for pilot and control, for temperature control, for communications, etc. will be done under Division 26 of these Specifications. Every electrical current consuming device furnished as a part of this project, or furnished by the Owner and installed in this project, shall be completely wired under Division 26. Verification of exact location, method of connection, number and size of wires required, voltage requirements, and phase requirements is the responsibility of the Contractor under Division 26. If conflicts occur between the drawings and the actual requirements, actual requirements shall govern.

1.8 PROGRESS OF WORK:

A. General: The Contractor shall keep himself fully informed as to the progress of the work and do his work at the proper time without waiting for notification from the Architect or Owner.

1.9 MANUFACTURER'S DIRECTIONS:

A. General: All manufactured articles shall be applied, installed and handled as recommended by the manufacturer.

1.10 MATERIALS AND WORKMANSHIP:

A. Materials: All materials shall be new unless otherwise specified and of the quality specified. Materials shall be free from defects and undamaged. All materials of a type for which the Underwriters Laboratories, Inc. have established a standard shall be listed by the Underwriters Laboratories, Inc. and shall bear their label.

B. Samples: The Architect reserves the right to call for samples of any item of material offered in substitution, together with a sample of the specified material, when, in the Architect's opinion,

the quality of the material and/or the appearance is involved and it is deemed that an evaluation of the two materials may be better made by visual inspection. This shall be limited to lighting fixtures, wiring devices, and similar items and shall not be applicable to major manufacturers' items of equipment.

C. Transportation: The Contractor shall be responsible for transportation of his materials to and on the job, and shall be responsible for the storage and protection of these materials and work until the final acceptance of the job.

D. Appurtenances: The Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.

E. Workmanship: The workmanship shall in all respects be of the highest grade and all construction shall be done according to the best practice of the trade.

1.11 PROTECTION OF APPARATUS:

A. General: The Contractor shall at all times take such precautions as may be necessary to properly protect his new apparatus from damage. This shall include the erection of all required temporary shelters to adequately protect any apparatus stored in the open on the site, the cribbing of any apparatus above the floor of the construction, and the covering of apparatus in the uncompleted 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 will be sufficient cause for the rejection of the pieces of apparatus in question.

1.12 PERMITS, FEE, ETC.:

A. General: The Contractor under each section of these Specifications shall arrange for a permit from the local authority. The Contractor shall arrange for all utility services, including electric services. If any charges are made by any of the utility companies due to the work on this project, the Contractor shall pay these charges, including charges for metering, connection, street cutting, etc. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these Specifications.

1.13 TESTING:

A. General: The Contractor under each division shall at his own expense perform the various tests as specified and required by the Architect and as required by the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

1.14 LAWS, CODES AND ORDINANCES:

A. General: All work shall be executed in strict accordance with all local, state and national codes, ordinances and regulations governing the particular class of work involved, as interpreted by the inspecting authority. The Contractor shall be responsible for the final execution of the work under this heading to suit those requirements. Where these Specifications and the accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect, shall prepare any supplemental drawings required illustrating how the work may be installed so as to comply and, on approval, make the changes at no cost to the Owner. On completion of the various portions of the work the installation shall be tested by the constituted authorities, approved and, on completion of the work, the Contractor shall obtain and deliver to the Owner a final certificate of acceptance.

1.15 COOPERATION:

A. General: The contractor for the work under each section of these Specifications shall coordinate his work with the work described in all other sections of the Specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these Specifications shall be handicapped, hindered or delayed at any time.

1.16 COORDINATION OF TRADES:

A. General: The Contractor shall be responsible for resolving all coordination required between trades. For example, items furnished under Divisions 21, 22 and 23 which require electrical connections shall be coordinated with Division 26 for:

1. Voltage
2. Phase
3. Ampacity
4. No. and size of wires
5. Wiring diagrams
6. Starter size, details and location
7. Control devices and details

B. Ceiling Mounted Items: Items installed in/on finished ceilings shall be coordinated with the ceiling construction. The Contractor under each section shall conform to the reflected ceiling plan and shall secure details and/or samples of the ceiling materials as necessary to insure compatibility. Any device not conforming to this requirement shall be replaced by the Contractor at his expense.

C. Electrical Items: All items specified under Divisions 26 shall be installed tight, plumb, level, square and symmetrically placed in relation to the work of other trades.

1.17 CUTTING AND PATCHING:

A. General: The Contractor for work specified under each section shall perform all structural and general construction modifications and cut all openings through either roof, walls, floors or ceilings required to install all work specified under that section or to repair any defects that appear up to the expiration of the guarantee. All of this cutting shall be done under the supervision of the Architect and the Contractor shall exercise due diligence to avoid cutting openings larger than required or in wrong locations.

B. Structural Members: No cutting shall be done to any of the structural members that would tend to lessen their strength, unless specific permission is granted by the Architect to do such cutting.

C. Patching: The Contractor for work under each section shall be responsible for the patching of all openings cut to install the work covered by that section and to repair the damage resulting from the failure of any part of the work installed hereunder.

D. Coordination: Before bidding, the Contractor shall review and coordinate the cutting and patching required with all trades.

E. Existing Surfaces: In all spaces where new work under Division 26 is installed and no other alteration or refinishing work is shown or called for, existing floors, walls and ceilings shall be restored to match existing conditions. Workmen skilled in the affected trade shall do all cutting and patching.

F. Masonry Walls: Where openings are cut through masonry walls, the Contractor under each respective section shall provide and install lintels or other structural supports to protect the remaining masonry and adequate support shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc. shall be of the size, shape, and installed as directed by the Architect.

1.18 PAINTING:

A. General: Painting for Division 26 shall be as follows:

B. If the factory finish on any apparatus or equipment is marred, it shall be touched up and then given one coat of half-flat-half-enamel, followed by a coat of machinery enamel of a color to match the original. Paint factory primed surfaces.

C. Paint all exposed conduit, boxes, cabinets, hangers and supports, and miscellaneous metal.

D. Generally, painting is required on all surfaces such that no exposed bare metal is visible.

1.19 LARGE APPARATUS:

A. General: Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through windows, doorways or shafts, shall be brought to the job by the Contractor involved and placed in the space before the enclosing structure is completed.

1.20 RELOCATION OF EXISTING INSTALLATIONS:

A. General: There are portions of the existing electrical system that shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of his particular trade and that of all other trades. All such existing installations that interfere with new installations shall be relocated by the Contractor under the Division in which the existing material normally belongs, and in a manner as directed by the Architect. For example where existing conduit and electrical equipment interferes with the installation of new work; it shall be relocated under Division 26. Failure to become familiar with the extent of the relocation work involved shall not relieve the Contractor of responsibility and shall not be used as a basis for additional compensation.

1.21 INSTALLATION DRAWINGS:

A. General: It shall be incumbent upon the Contractor to prepare special drawings as called for elsewhere herein or as directed by the Architect to coordinate the work under each section, to illustrate changes in his work, to facilitate its concealment in finished spaces to avoid obstructions or to illustrate the adaptability of any item of equipment which he proposes to use. These drawings shall be used in the field for the actual installation of the work. Unless otherwise directed, they shall not be submitted for approval but three copies shall be provided to the Architect for his information.

1.22 ROUGH-IN AND MAKE FINAL CONNECTION FOR EQUIPMENT:

A. General: The shop drawings for all equipment are hereby made a part of these Specifications. The Contractor under each section of the Specifications shall rough-in for the exact item to be furnished on the job, whether in another section of the Specifications or by the Owner. The Contractor shall refer to all drawings and other sections of the Specifications for the scope of

work involved for the new equipment, and by actual site examination determine the scope of the required equipment connections for the Owner furnished equipment.

B. Discrepancies: Should any of the equipment furnished require connections of a nature different from that shown on the drawings, report the matter to the Architect and finally connect as directed by the Architect. Minor differences in the equipment furnished and that indicated on the drawings will not constitute ground for additional payment to the Contractor.

1.23 TEMPORARY POWER AND LIGHTING

A. General: Engage the appropriate local utility company to install temporary service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

B. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.

C. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

D. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.

E. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.

F. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear. All temporary power for construction will be provided by Contractor. Owner will pay bills when submitted for payment.

G. Install electric power service underground, except where overhead service must be used.

H. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, power wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance. All circuits must be ground-fault circuit interrupter protected.

I. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment. Provide four gang outlets, spaced so 100 foot cords can reach any areas. Provide separate 120 VAC, 20 amp GFCI circuit for each four gang outlet.

J. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

K. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching:

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

L. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

M. Provide three 100-W incandescent lamps (or equal) per 500 sq. ft. (45 sq. m), uniformly distributed, for general lighting, or equivalent illumination.

N. Provide two 100-W incandescent lamps (or equal) every 50 feet (15 m) in traffic areas.

O. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the work is being performed.

1.24 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. 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 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping".

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.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

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. Metraflex Co.
b. 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. 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.

2.3 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.

F. Field Conditions: The electrical Drawings do not give exact details as to elevations of electrical lines, exact locations, etc., and do not show all the offsets, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the architectural and structural conditions, to avoid all obstruction, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation.

G. Locations of Electrical Devices: The electrical Drawings show diagrammatically the locations of the various electrical outlets and apparatus and the method of circuiting and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general Drawings and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with other sections, and in all cases shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in location of any outlet or apparatus before installation (within 10 feet of location shown on drawings) or after installation if an obvious conflict exists, without additional cost to the Owner.

H. Space Requirements: The Contractor shall be responsible for the proper fitting of his material and apparatus into the space. Should the particular equipment that any bidder proposes to install require other space conditions than those indicated on the drawings, he shall arrange for such space with the Architect before submitting his bid. Should changes become necessary on

account of failure to comply with this clause, the Contractor shall make such necessary changes at his (the Contractor's) own expense.

I. Equipment Connections: Conduits serving outlets on items of equipment shall be run in the most appropriate manner. Where the equipment has built-in chases, the lines shall be contained therein. Where the equipment is of the open type, the lines shall be run as close as possible to the underside of the top and in a neat and inconspicuous manner.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations. Install sleeves during erection of slabs and walls.

C. 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.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Extend sleeves installed in floors 2 inches above finished floor level.

F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

G. 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.

H. 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 07 Section "Joint Sealants.".

I. 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 07 Section "Penetration Firestopping."

J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe 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.

L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch 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 07 Section "Penetration Firestopping."

3.5 SELECTIVE ELECTRICAL DEMOLITION

A. Disconnect and remove all electrical apparatus, electrically operated equipment and devices as required in order to complete the demolition phase of the project as shown on the drawings. Where a wall or partition is shown to be removed, remove all electrical devices in that wall or partition even if the device is not shown on the drawings. Removal of a piece of electrical or electrically operated equipment includes removing all associated raceway and wiring back to source. Source is defined as the panelboard where the circuit conductors originate or the nearest junction box that contains part of the affected circuit that is not affected by demolition or construction. Reroute all electrical circuitry passing through removed walls or partitions.

B. Remove all unused or vacated panel circuit breakers and install blanking plates. Re-label directory as “Space.”

C. Re-route all conduits that will conflict with openings in walls, floors and roofs for access or for mechanical piping, ducts and new electrical conduits, or new mechanical equipment, piping, and ducts.

D. Conduits which are poured into slabs or roof decks and thus positively and effectively concealed, are the only facilities which if required to be moved, are not included in this provision, but shall be handled as a change in the Contract.

E. Reconnect all circuits in re-routed conduits to perform the existing function.

F. Existing conduit abandoned in place by the demolition phase of the project may be reused if it is concealed, meets the requirements of the drawings and is installed according to this set of specifications.

G. Provide a junction box in the ceiling as required to maintain raceway continuity where walls containing devices are removed.

H. Existing wall outlet boxes, whether retained for wiring or left empty, shall be covered by a standard-sized blank plate. Close all openings in boxes in suspended ceilings.

I. Maintain accessibility of all boxes containing wiring.

J. Restore all ceiling in existing areas, removed for installation of new work, to original condition.

K. Where conduits rising from the floor are to be abandoned, cut conduit off below floor level and patch floor to be level and of same finish. Cut into existing floors carefully only where specifically shown and patch and refinish the floor.

L. Circuit breakers installed in existing panelboards shall be of the same type and manufacture as the panelboard.

M. Prior to cutting or coring any existing structural component of the building, obtain permission of the structural engineer.

END OF SECTION 26 05 00

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SECTION 26 05 19

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.

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. 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.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN

D. Multiconductor Cable: Comply with NEMA WC 70 for Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

A. 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.

B. 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. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway

D. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway

H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

I. Class 2 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 Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "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 Division 26 Section "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 Division 07 Section "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Testing: Contractor shall Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19

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SECTION 26 05 29

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.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

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. 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:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. Thomas & Betts Corporation.
      d. Unistrut; Tyco International, Ltd.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. 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 hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated 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. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. Hilti Inc.
   d. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
2. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
3. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
4. Toggle Bolts: All-steel springhead type.
5. Hanger Rods: Threaded steel.

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 3/8 inch in diameter.

C. All electrical conduit, boxes, etc must be supported as specified by the NEC and by the various equipment manufacturer and installation standards. All electrical equipment must be supported with materials specifically made for the purpose. Do not use wire hangers. Do not attach electrical equipment to air conditioning duct system. Use conduit clamps, trapeze supports or Caddy fasteners. In addition to attachment to the structure, attach to ceiling system only if approved by and coordinated with ceiling system section. Multiple runs of conduit shall be supported by steel channels (Unistrut) or equivalent multiple hangers. Each conduit shall be clamped at each channel.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted 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 two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.

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. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

END OF SECTION 26 05 29

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SECTION 26 05 33

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, and enclosures for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate conduit.

E. LFMC: Liquidtight flexible metal conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings.

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:

1. Alflex Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. O-Z Gedney; a unit of General Signal.
4. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

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, and Cable: 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, set-screw 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 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. Hoffman.
3. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
4. O-Z/Gedney; a unit of General Signal.
5. RACO; a Hubbell Company.
6. Thomas & Betts Corporation.
7. Walker Systems, Inc.; Wiremold Company (The).

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Exposed Surface Mounted Outlet and Device Boxes: Cast iron with electrostatically applied powder coating, equal to Hubbell FS type.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit for sizing less than 2 inches in size, rigid aluminum conduit for sizes 2 inches and larger.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
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. Conduit, 3/4-inch to 2-1/2 inch: EMT
2. Conduit, 3 inch and larger: Rigid steel or intermediate (IMC) conduit.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC.
4. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Maximum LFMC Length: 3 feet.

E. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION OF RACEWAYS

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. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

D. Install no more than the equivalent of three 90-degree bends in any conduit run for which fewer bends are allowed.

E. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

F. Threaded Conduit Joints, Exposed to Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

I. Flexible Conduit Connections: Use minimum 36 inches and maximum of 72 inches of LFMC for lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for motors.

3.3 INSTALLATION OF BOXES

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual situations.

C. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of outlets prior to rough-in.

D. Locate and install boxes to allow access.

E. Secure boxes rigidly to the substrate upon which they are being mounted. Boxes shall not be permitted to move laterally.

F. Provide knockout plugs for unused openings.

G. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

H. Outlet boxes supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures, not from acoustic ceilings.

I. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

J. Support pull and junction boxes independent of conduit.

K. Conduit shall not be mounted in or on the floor.

3.4 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.

END OF SECTION 26 05 33

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SECTION 26 05 43

UNDERGROUND ELECTRICAL DUCT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

1.2 SUBMITTALS:

A. General: Submit manufacturer's data on all materials according to Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Submit for review complete manufacturer's catalog information on all items specified herein, including materials, construction and UL listing.

C. Precast Manholes: Submit for review complete manufacturer's catalog information. Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes. Include instructions for storage, handling, protection, examination, preparation, and installation.

D. Coordination Drawings: Submit complete coordination drawings for review showing duct profiles and coordination with other utilities and underground structures. Include plans and sections drawn to accurate scale.

1.3 SCOPE:

A. Description: The work shall include furnishing and installing all underground electrical duct and direct burial conduit and pullboxes together with all other accessories required.

B. Manholes: The work shall include furnishing and installing all precast manholes together with all other accessories required.

1.4 REGULATORY REQUIREMENTS:

A. Code Requirements: Conform to requirements of ANSI/NFPA 70 (National Electrical Code) and all applicable State and Local Electrical Ordinances.

B. UL Listing: Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. General: Deliver, store, protect, and handle Products to site under provisions of the General Requirements. Accept conduit on site. Inspect for damage. Report concealed damage to carrier within their required time period. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.6 PROJECT CONDITIONS:

A. Field Measurements: Verify that field measurements are as shown on Drawings.

B. Coordination: Coordinate layout and installation of ducts, manholes and pullboxes with final arrangement of other utilities as determined in the field.

C. Ductbank: Verify routing and termination locations of duct bank prior to excavation for rough-in. Duct bank routing is shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete duct system.

D. Manholes: Verify locations of manholes prior to excavating for installation. Manhole locations are shown on Drawings in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

1.7 PROJECT RECORD DOCUMENTS:

A. General: Submit under provisions of the General Requirements.

B. As-built Drawings (Ductbanks): Accurately record actual locations of exact routing of ductbank.

C. As-built Drawings (Manholes): Accurately record actual locations of each manhole.

PART 2 - PRODUCTS

2.1 UNDERGROUND DUCTS:

A. Description: Plastic electrical conduits and fittings, in strict accordance with the requirements of Western Underground Model Specification No. 3.1, PLASTIC CONDUIT AND FITTINGS. Conduits shall be Type EB for encased burial. Material shall be virgin polyvinyl chloride (PVC). Conduits shall be Carlon or equivalent.

2.2 CONDUITS:

A. Underground Plastic Conduit: Type 40, heavy wall, high impact rigid virgin polyvinyl chloride (PVC) conduit and fittings, conforming to NEMA Publications TC2 and TC3 and UL listed for direct burial use; Carlon or equivalent.

B. Rigid Steel Conduit: As specified under Section 16110 - RACEWAYS AND FITTINGS.

2.3 PULLBOXES:

A. Cast Iron Pull Boxes: Cast iron box, and frame. Cross-ribbed, heavy-duty cover to support heavy pedestrian or light vehicular traffic. Cover with non-slip checkered surface. Neoprene gasket attached to cover. Size pullbox as required by NEC. Appleton Series WSW or WST or approved equal.

B. Polymer Concrete/Fiberglass Pull Boxes: Constructed of polymer concrete and reinforced by a heavy-weave fiberglass. Cross-ribbed, heavy-duty cover to support heavy pedestrian or light vehicular traffic. Cover with non-slip checkered surface. Neoprene gasket attached to cover. Size pullbox as required by NEC. Composolite "PC" style as manufactured by Quazite or approved equal.

2.4 PRECAST CONCRETE MANHOLES:

A. Description: Furnish and install precast concrete manholes as described on the Drawings. Manhole shall be as manufactured by Dalworth Quickset Company or approved equivalent. Manholes shall be constructed of reinforced precast concrete modular sections with

tongue-and-groove joints. Reinforcing shall conform to AASHTO Classification H-20. The shape and dimensions shall be as indicated on the Drawings.

1. Sections: The base section shall include 3 inch deep x 14 inch round sump with cast sleeve, and two 1 inch ground rod openings. The top section shall include 39-inch diameter grooved opening for frame and cover. Provide a riser casting, 12 inch, with manhole step cast into frame.
2. Frames and Covers: ASTM A48; Class 30B gray cast iron, 30 inch size, machine finished with flat bearing surfaces. Provide cover marked ELECTRIC.
3. Duct Entry Provisions: Single duct knockouts with duct entry locations as indicated on the Drawings. The duct entry size shall be as shown on the Drawings.
4. Cable Provisions: Provide cable pulling irons. Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal. Cable rack inserts shall have a minimum load rating of 800 pounds. Locate as shown on the Drawings. Cable rack mounting channel shall be 1-1/2 x 3/4 inch steel channel, 48 inch length. Provide cable rack arm mounting slots on 1-1/2 inch centers. Cable racks shall be steel channel, 1-1/2 x 3/4 x 14 inches, with fastener to match mounting channel. Cable supports shall be porcelain clamps and saddles.
5. Ladder: Aluminum, with top hook to engage manhole step in riser casting. Provide one ladder for each manhole.
6. Sump Covers: ASTM A48; Class 30B gray cast iron.

2.5 ACCESSORIES:

A. Underground Warning Tape: 4-inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. General: Examine site to receive ducts and manholes for compliance with installation tolerances and other conditions affecting performance of the underground ducts and manholes. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 EXCAVATION:

A. General: Perform all excavation work required in connection with the installation of the work under this Division. After the electrical work has been installed, tested and approved, backfill all excavations with suitable material under the direction of the Architect. Include the cutting of all sidewalks, streets and other pavement and repairing the openings in them to return the surface to approximately its original condition. Perform all excavations of every description of whatever substances encountered and to the depths required for installation of the work under this Division.

B. Backfill Material: During excavation, stack material suitable for backfilling in an orderly manner a sufficient distance from the banks of the trenches to prevent slides or cave-ins. Remove all excavated material not required or suitable for backfill, or waste as directed. Control grading to prevent surface water from flowing into excavations and remove any water accumulating therein by pumping.

C. Grading: Use open cut grading and make trenches of the necessary width for proper installation of the lines with banks as nearly vertical as possible. Grade the bottom of trenches accurately to provide uniform bearing and support for conduit or duct on undisturbed soil at every point along its entire length.

D. Special Conditions: Except at locations where excavation of rock from the bottoms of trenches is required, take care not to excavate below the depths required. Where rock excavation is required, remove the rock to a minimum overdepth of 4 inches below the trench depths specified. Backfill the overdepth rock excavation and all excess trench excavation to the proper level with 3/4 inch crushed rock or the equivalent in coarse gravel prior to the installation of conduit or ducts. Whenever wet or otherwise unstable soil that is incapable of properly supporting conduits or ducts is encountered in the trench bottom, remove such soil to a depth required and backfill the trench to trench bottom grade with 3/4 inch crushed rock or coarse gravel or other suitable material.

3.3 BACKFILLING:

A. General: Carefully backfill trenches with earth, sandy clay, sand and gravel, soft shale or other approved material free from large clods of earth or stone, deposited in thoroughly and carefully rammed 6-inch layers. Do not use blasted rock, broken concrete or pavement, or large boulders as backfill material. Settling the backfill with water will be permissible and will be required when so directed. Re-open any trenches improperly filled or where settlement occurs to the depth required for proper compaction, then refill, mound over and smooth off.

B. Beneath Pavement: Backfill open trenches across roadways or other areas to be paved as specified above except that the entire depth of trench shall be backfilled in 6-inch layers, each layer moistened and compacted to a density of not less than 95% Standard Proctor in such manner as to permit the rolling and compaction of the filled trench together with the adjoining earth to provide the required bearing value and permit paving of the area immediately after backfilling is completed. Along all other portions of the trenches, grade the ground to a reasonable uniformity and leave the mounding over the trenches in a uniform and neat condition.

C. Surface Restoration: Restore surface features at areas disturbed by excavation, and reestablish original grades except as otherwise indicated. Replace removed sod as soon as possible after backfilling is completed. Restore all areas disturbed by trenching, storing of dirt and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching.

3.4 OPENING AND CLOSING PAVEMENT:

A. General: Where excavation requires the opening of existing walks, streets, drives or other existing pavement, including "black topping," cut the pavement as required. Hold the size of the cut to a minimum consistent with the work to be accomplished. After the installation of the new work is completed and the excavation has been backfilled, patch the paving using materials to match those cut out. Take care that the patches are level with the original surfaces and thoroughly bond with them.

3.5 INSTALLATION OF UNDERGROUND DUCTS:

A. General: Install duct according to manufacturer's written instructions. Use plastic electrical ducts, installed with concrete encasement, with a minimum of 3 inch of concrete between ducts and earth, and with 2 inches of concrete between adjacent ducts for like services. Provide 4 inches of concrete between power and signal ducts. Provide at least 30 inches of cover from top of concrete encasement to finished grade.

B. Ducts: Build up duct banks completely in the trench before any concrete is poured, using factory-fabricated plastic conduit spacers in staggered configuration to provide the proper horizontal and vertical spacings. Space separators close enough to prevent sagging and deforming of ducts, and secure separators to the earth and to ducts to prevent floating during concreting. Secure the entire assembly with heavy twine or cord to insure rigidity during pouring.

Do not use metal for this purpose. Assemble conduits with staggered adjacent couplings so that no two couplings will lie in the same transverse plane, in a vertical direction. Use solvent cement as directed by the duct manufacturer in making up all joints. Make joints in ducts and fittings watertight according to manufacturer's instructions. Fabricate duct runs with standard factory-made fittings, elbows and accessories.

C. Curves and Bends: Make all changes of direction, horizontal or vertical, with long sweep bends having a minimum radius of 25 feet, except that manufactured bends at or near the ends of the runs may be used on short runs of 100 feet or less. Make long sweep bends with one or more curved or straight sections of duct.

D. Manufactured Bends: Manufactured bends, where permitted, shall have a minimum radius of 10 times the nominal duct diameter. Where manufactured ducts of greater than a 30 degree angle are required, use rigid hot dipped galvanized steel conduit bends.

E. Protection: During construction, protect partially completed duct lines from entrance of dirt and debris by means of suitable factory-made duct plugs. After completion of installation, seal all ends of spare ducts with factory made duct plugs.

F. Slope: Install with uniform slope for drainage, with no low pockets to collect water. Install duct with minimum slope of 4 inches per 100 feet. Slope duct away from building entrances.

G. Slope Toward Manholes: Pitch ducts minimum of 4 inches per 100 feet to drain toward manholes and away from buildings and equipment. Slope ducts from a high point in runs between 2 manholes to drain in both directions.

H. Duct Entrances to Manholes: Space end bells approximately 10 inches on center for 4-inch ducts and varied proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into manhole walls from both sides to provide watertight entrances.

I. Terminations: Where ducts enter in or under buildings, or turn up through equipment pads, change from plastic duct to rigid galvanized steel conduit below grade a minimum of 5 feet outside the structure, using suitable factory adapters. At the point of change of materials, extend the concrete envelope to enclose at least 2 feet of steel conduit. Wrap all steel conduits and fittings buried in earth as specified elsewhere herein, or use PVC coated steel conduits. Install reinforcing in duct banks passing through disturbed earth near buildings and other excavations. Coordinate duct bank with structural design to support duct bank at wall without reducing structural or watertight integrity of building wall.

J. Concrete: Concrete shall contain a red dye additive to give a distinctive red color when concrete is cured. Install the concrete envelope for a given duct run in one pour where possible. When more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into the concrete on both sides of joint near the corners of the envelope. Use concrete of 3000 psi compressive strength. In pouring concrete, do not allow heavy masses of concrete to fall on ducts. Direct flow of concrete down sides of assembly to bottom, forcing it to flow to center of bank and then to rise up in middle, filling all spaces uniformly. Spade concrete liberally and carefully with a long, flat slicing bar between vertical rows to eliminate voids. Weight or brace the duct bank assembly if necessary, to prevent the assembly from floating. Because of the fact that plastic conduits may expand considerably during construction, each run and its concrete envelope shall be installed starting at one end and proceeding toward the other with any necessary adjustments to length being made at the end toward which the work is progressing.

K. Reinforcing: Reinforce duct banks where they cross disturbed earth and where indicated on the Drawings.

L. Forms: Use the walls of the trench to form the side walls of the duct bank where the soil is self-supporting and concrete envelope can be poured without soil inclusions, otherwise, use forms.

M. Cleaning: After ducts are installed, complete with envelope, and before pulling any cable, pull a mandrel through every duct to check for alignment and clear passage. Use an iron-shod mandrel with a diameter of l/4 inch less than the nominal size of the duct and a length equal to the duct diameter. Mandrel shall have a leather or rubber gasket slightly larger than the duct hole. After testing the ducts with the mandrel, pull a stiff-bristled brush through each duct until it is clear of all particles of earth, sand or gravel; then install duct plugs immediately.

N. Pulling Cord: Install 100-pound-test nylon cord in ducts, including spares.

3.6 INSTALLATION OF UNDERGROUND PLASTIC CONDUIT:

A. General: Install conduit according to manufacturer's written instructions. Install at least 30 inches below finished grade unless noted to the contrary. Assemble and install raceways in accordance with manufacturer's instructions. Make joints with couplings and solvent cement. Fabricate bends of 30 degrees or more with factory-made elbows, or make field bends with proper heating equipment. Bends showing signs of overheating or flattening are unacceptable. Ream ends of all conduit before joining. "Snake" plastic conduit in trench, from side to side, with a complete cycle every 40 feet to allow for expansion and contraction. Maintain this configuration during backfilling.

B. Separation Between Conduits: 3 inches minimum for like services, and 6 inches minimum between power and signal ducts.

C. Terminations: Where conduit turns up out of earth, or floor slabs, change from plastic to rigid galvanized steel conduit below grade and outside of such structures. Do not extend any plastic conduit above grade. Make similar change from plastic to rigid galvanized steel conduit at connections to underground pull or junction boxes. Wrap all steel conduits and fittings buried in earth as specified elsewhere herein, or use PVC coated steel conduits.

D. Waterproof Wall and Floor Entrances: Install a watertight entrance sealing device with the sealing gland assembly on the inside. Anchor device into masonry construction with 1 or more integral flanges. Secure membrane waterproofing to the device to make permanently watertight.

E. Pulling Cord: Install 100-pound-test nylon cord in each conduit, including spares.

3.7 INSTALLATION OF UNDERGROUND STEEL CONDUIT:

A. General: Install conduit according to manufacturer's written instructions. All steel conduit in earth shall be rigid galvanized steel conduit. Wrap such conduit with 0.020-inch thick vinyl plastic tape, half lapped to give a double thickness wrap. Remove all oil, grease and dirt from conduit with a suitable solvent, and clean and dry conduit before wrapping. If conduit is pre-wrapped in the shop and then cut and joined on the job, wrap all joints on the job, overlapping pipe wrapping 3 inches on both sides of joints.

3.8 INSTALLATION OF WARNING TAPE:

A. General: Identify underground conduits and ducts using underground warning tape. Install warning tape 12-inches below grade directly above all underground electrical ducts and conduit. Install one tape per trench.

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3.9 INSTALLATION OF PULLBOXES:

A. General: Install cast iron pullboxes in concrete pad with 4 inches minimum concrete on all sides of pullbox. Set top of pullbox flush with concrete. Do not install pullbox in low areas where water may stand.

3.10 INSTALLATION OF PRECAST MANHOLE:

A. General: Install and seal precast sections in accordance with manufacturer's instructions. Install manholes plumb. Use precast neck and shaft sections to bring manhole cover to finished elevation. Attach cable racks to inserts after manhole installation is complete. Install drains in manholes and connect to 4 inch pipe terminating in 1/3 cu yd crushed gravel bed. Dampproof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days.

END OF SECTION 26 05 43

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SECTION 26 05 53

ELECTRICAL IDENTIFICATION

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. Identification for conductors.
2. Equipment identification labels.
3. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with 29 CFR 1910.145.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

A. Conductor Color-Coding: Factory-applied color coded insulation.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wrap around type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a black background. Minimum letter height shall be 3/8 inch.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Paint:

1. Exterior Ferrous Metal:
   a. Semigloss Alkyd-Enamel Finish: Two finish coats over a primer.
      1) Primer: Exterior ferrous-metal primer.
      2) Finish Coats: Exterior semigloss alkyd enamel.

2. Exterior Zinc-Coated Metal (except Raceways):
   a. Semigloss Alkyd-Enamel Finish: Two finish coats over a primer.
      1) Primer: Exterior zinc-coated metal primer.
      2) Finish Coats: Exterior semigloss alkyd enamel.

3. Interior Ferrous Metal:
   a. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
      1) Primer: Interior ferrous-metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

4. Interior Zinc-Coated Metal (except Raceways):
   a. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
      1) Primer: Interior zinc-coated metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

C. 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 APPLICATION

A. Branch-Circuit Conductor Identification: In each junction box, pull box, and panelboard; use marker tape to identify each ungrounded conductor according to source and circuit number.

B. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and 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. Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where 2 lines of text are required, use labels 2 inches high.
   b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:
   a. Disconnect switches.
   b. Contactors.

3.2 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. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

E. System Identification Color Banding for Raceways and Cables: Each color 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 maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits: Colors shall match existing building color code.
3. Colors for 480/277-V Circuits: Colors shall match existing building color code.
4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches 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.

END OF SECTION 26 05 53

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SECTION 26 09 13
EMERGENCY/STANDBY POWER SYSTEMS
DIESEL GENERATOR SET(S)

PART 1 - GENERAL

1.1 SCOPE

A. Provide complete factory assembled generator set equipment with digital (microprocessor-based) electronic generator set controls, digital governor, and digital voltage regulator. Supplier shall provide equipment meeting the space restriction for the location of the generator, enclosure, and fuel tank.

B. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.

C. The generator set manufacturer shall warrant all equipment provided under this section so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

D. The generator set supplier shall be responsible for complete compliance to all specification requirements.

E. Prototype testing, factory testing, site testing.

1.2 CODES AND STANDARDS

A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.
1. ANSI S1.13-1971—Measurement of Sound Pressure Levels in Air
2. CSA 282-05 -- Emergency Electrical Power Supply for Buildings
3. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
4. NFPA 30 – Flammable and Combustible Liquids
5. NFPA 37 – Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines
6. NFPA 70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
7. NFPA 110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

B. The generator set and supplied accessories shall meet the requirements of the following standards:
1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
2. UL142 – Sub-base Tanks
3. UL1236 – Battery Chargers
4. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed..

C. The control system for the generator set shall comply with the following requirements.
   1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
   2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
   3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
   4. FCC Part 15, Subpart B.
   5. IEC 8528 part 4. Control Systems for Generator Sets
   6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.

D. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.3 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cummins Power Generation
   2. Caterpillar

B. Equipment specifications for this Project are based on generators manufactured by Cummins Power Generation. Should any substitutions be made, the contractor shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

1.4 SUBMITTALS

A. Shop drawings:
   1. Outline drawings of assembly.
   2. One line diagrams and wiring diagrams for assembly and components.
   3. Interconnection wiring diagrams
   4. Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.

B. Product data:
   1. Technical data on all major components. Technical data must include an alternator thermal damage curve, description and operating characteristics of the alternator protection device, and an alternator reactive capability curve.
   2. Certification of the emissions performance of the generator set engine by the engine manufacturer.
   3. Seismic certification as required.

C. Project information:
   1. Test reports and certifications.
   2. Factory test procedures.

D. Contract closeout information:
   1. Operating and maintenance data.

1.5 QUALIFICATIONS

A. The manufacturer of this equipment shall have produced similar equipment for a minimum period of ten years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.6 REGULATORY REQUIREMENTS

A. The generator set shall be UL2200 listed and labeled

B. The generator set overcurrent protection shall be UL listed as a utility grade protective device.

C. The generator set engine shall comply will all applicable federal, state, and local emissions standards at the date of installation.

1.7 WARRANTY

A. The manufacturer shall warrant the material and workmanship of the generator set for a minimum of two (2) years from registered commissioning and start-up, or eighteen (30) months from date of shipment.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc. shall be allowed during the minimum noted warranty period described in paragraph A above.

PART 2 - PRODUCTS

2.1 GENERATOR SET

A. Ratings
1. The generator set shall operate at 1800 rpm and at a voltage of: 120/208 Volts AC, Three phase, 4-wire, 60 hertz.
2. See project drawings for generator sizes. The complete generator set shall be rated per ISO8528 at 0.8 PF[1], Standby rating, based on site conditions of: Altitude 1000 feet, ambient temperatures of 122 degrees F, based on temperature measured at the control for indoor installations, and measured at the air inlet closest to the alternator for outdoor equipment.
3. The generator set rating shall be based on emergency/standby service and marked as such per NFPA110.

B. Performance
1. Voltage regulation shall not exceed one percent for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
3. The diesel engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
4. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.

[1] The power factor used for single phase generator sets is 1.0.

5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples. Telephone influence factor shall be less than 50.
6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.

C. Construction
1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.
3. All outdoor equipment shall be enclosed with corrosion-protected materials. Steel components used in enclosures shall be powder coated and baked, and shall provide fade and corrosion resistance in compliance to Dry film thickness shall be shd3363 of 2H+all a minimum of 1.8 Mils, gloss at 60degrees per ASTMD523 of 80+/- 10, pencil hardness per ASTM D3363

D. Connections
1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.
3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.2 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be diesel, 4 cycle, radiator and fan cooled. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:

B. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous or parallel states.

C. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the alternator air inlet. Radiator fan shall be suitable for use in a system with 0.5 in H_2O restriction. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental contact.

D. Electric starters capable of three complete cranking cycles without overheating. V-block engines shall be provided with dual starters.

E. Positive displacement, mechanical, full pressure, lubrication oil pump.

F. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

G. An engine driven, mechanical, positive displacement fuel pump. A primary set of Racor or Fleetguard fuel filters shall be provided to allow the operator to change filters while the engine is operating. A secondary set of engine mounted fuel filters shall provided with replaceable spin-on canister elements.

H. Replaceable dry element air cleaner with restriction indicator.

I. Flexible supply and return fuel lines.

J. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.

K. Coolant heater
   1. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
   2. The coolant heater shall be installed on the engine with SAEJ20 compliant materials. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using isolation valves to isolate the heater for replacement of the heater element. The design shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
   3. The coolant heater shall be provided with a 24VDC thermostat, installed at the engine thermostat housing. An AC power connection shall be provided for a single AC power connection to the coolant heater system.
   4. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 40C in a 15C ambient, in compliance with NFPA110 requirements, as a minimum, or the temperature required for starting and load pickup requirements of this specification.

L. Provide vibration isolators, as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

M. The generator set shall be provided with a main line circuit breaker as shown on the project drawings. Breakers shall be sized to carry the rated output current of the generator set. The circuit breakers shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.

N. Starting and Control Batteries shall be lead acid type, 24 volt DC, sized as recommended by the engine manufacturer for compliance to NFPA110 starting requirements, complete with battery cables and connectors. V-block engines shall be provided with redundant battery strings tied

together with a best battery selector switch. Batteries shall be installed in an acid resistant battery box with heaters sized by the manufacturer.

O. Provide dual inlet exhaust silencers for each engine of size and type as recommended by the generator set manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed inside the enclosure according to the engine manufacturer's recommendations and applicable codes and standards.

P. Provide fully regulated, constant voltage, current limited, multi-rate battery charger. The chargers shall be designed for heavy-duty industrial service, primarily to quickly recharge and maintain batteries that start internal combustion engines. Charger shall be rated a minimum of 10 amps.
   1. Charger shall provide 4 distinct charge states: "dead battery", "bulk charge", "absorption", and "float". Charge rate shall be temperature compensated to provide proper charging in ambient conditions from –20 to +55C.
   2. Provider LED indication of general charger condition, including charging, fault, and equalize. Provide a 2 line LCD display to indicate charge rate, battery voltage, faults, and provide for charger set up. Charger shall provide relay contacts for fault conditions as required by NFPA110.
   3. The charger shall operate properly during fault conditions, including battery disconnection while charging, reversed battery polarity connections, and shorted battery.
   4. The charger shall be compliant to the same RFI/EMI and voltage surge performance as are specified for the genset control

Q. Sound protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.
   1. The enclosure shall be rated to dampen the sound of the generator to no more than 65 decibels at 70 feet from the enclosure. Manufacture shall provide documentation showing this is met by the enclosure alone. No walls on the generator yard shall be used in the sound dampening calculations.
   2. The enclosure shall be constructed of 14 gauge galvannealed steel outer skin with stiffeners, 14 gauge galvannealed steel skin roof with stiffeners and framing, 22 gauge perforated galvanized steel inner skin. Skin panels shall be welded to the frame; hard or pop riveting and bolts are not acceptable.
   3. Enclosure shall have a cambered roof to aid in rain runoff.
   4. Enclosure structure shall include full length channels on the bottom and rectangular tube frame. The structure shall be completely sealed welded at all connection points and steel end caps welded at all open tube ends. The base channel shall be provided with mounting holes that will allow the enclosure to be fastened directly to the base skid or foundation.
   5. Doors shall be 14-gauge galvanealed steel construction painted to match the enclosure exterior and incorporated into 14-gauge galvanealed steel frames that are structurally integrated into the enclosure wall. Two sets of double doors shall be provided on each side of the enclosure. The doors shall include the following:
      a. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance.
      b. Door hardware shall include 304 S.S. leaf hinges, chrome plated refrigerator type latches with inside release, and S.S. bolting hardware. The inside release shall allow escape from within when locked externally.
      c. Rain lip over all doors.
   6. The enclosure shall be provided with the following:
      a. Radiator discharge elbow / vertical plenum designed to direct radiator air vertically.
      b. Inlet weather louvers with birdscreen which aid in the dispersion and removal of water from the air stream
      c. The air shall discharge through aluminum gravity backdraft dampers.

d. Four (4) Lifting lugs for lifting of the enclosure only

7. General enclosure design will be able to withstand the following loadings: 125 mph winds, 50 lbs/sq. ft. roof loads, rain resistant to 4" per hour, maximum static pressure drop less than 0.5 inches of water through the enclosure, and zone 2 earthquakes.
8. Inlet and exiting airflow shall be at each end providing a free flow of air through the enclosure.
9. A minimum of 36" shall be provided at the back end of the gen-set skid for access and maintenance
10. Radiator air duct work / flashing shall be installed before shipment. Field installation is not acceptable.
11. Enclosure electrical package shall include:
    a. AC Load Panel
    b. Interior lighting: Four "TA" fluorescent light fixtures with two 4 foot bulbs wired to AC panel
    c. Exterior light fixture at each set of doors with switch
    d. Two light switches inside the enclosure
    e. Two 20 Amp GFCI duplex receptacles interior and one weatherproof 20 Amp GFCI duplex receptacle exterior
    f. All generator auxiliary loads shall be wired to the AC load panel for customer connection via EMT galvanized conduit with EMT connections. All electrical shall be rated weather tight.
12. Finish: Enclosures exterior surfaces shall be cleaned, primed and painted with one coat of epoxy and one coat of polane polyurethane.

R. Fuel Storage Tank
1. The tank shall be manufactured in compliance with the following codes and standards:
    a. UL 142 – Underwriters Laboratories Standard
    b. NFPA 30 - Flammable and Combustible Liquids
    c. NFPA 37 - The Standard for Installation and use of Stationary Combustible Engine and Gas Turbines
    d. NFPA110 – The Standard for Standby and Emergency Power Systems
2. Provide a UL 142 sub-base fuel storage tank with a 24 hour capacity.
3. The tank shall include the following:
    a. 4" fill port with overfill prevention valve
    b. 5 gallon fill/spill dam or bucket
    c. Mechanical fuel level gauge
    d. Normal vent with cap
    e. Emergency vents
    f. Low fuel level sensor
    g. High fuel level sensor
    h. Leak detection sensors for the primary and secondary areas
    i. Integral lifting provisions to lift entire package assembly
    j. Electrical Stub up(s)

2.3 LOW VOLTAGE AC ALTERNATOR

A. The AC alternator shall be; synchronous, four pole, 2/3 pitch, brushless, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. The alternator design shall prevent shaft current from flowing and eliminate the need for insulated bearings. All insulation system components shall meet NEMA MG1 requirements for Class H insulation systems. Actual temperature rise measured by resistance method at full load shall not exceed 125°C in a 40°C ambient.

B. The alternator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage up to 5 percent above or below rated voltage.

C. The alternator shall be supplied with an dedicated, independent power source for the voltage regulation system, which provides sufficient excitation for the alternator to supply 300% of rated output current for 10 seconds.

D. The subtransient reactance of the alternator shall not exceed 16 percent, based on the standby rating of the generator set.

E. Provide an anti-condensation heater for the alternator for generator sets installed outdoors or in unheated environments.

2.4 GENERATOR SET CONTROL.

A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, protection and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
   1. The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
   2. The generator set mounted control shall include the following features and functions:

B. Control Switches
   1. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or Manual position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
   2. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting. The switch shall include a lockout provision for use in safely disabling the generator set for necessary service.
   3. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
   4. PANEL LAMP switch. Operating the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is operated, or after the switch is operated a second time.
   5. Voltage and Frequency Adjustment. The genset mounted control shall include digital raise/lower switches for adjustment of voltage and frequency.

C. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:
   1. Analog voltmeter, ammeter, frequency meter, and kilowatt (KW) meter[2]. Voltmeter and ammeter shall display all three phases. Ammeter and KW meter scales shall be color coded in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red.

[2] An acceptable alternate to the specified bargraph displays would be conventional needle-type instruments, with the color coding required located on the display of the meter. Needle type instruments are susceptible to misoperation due to non-linear distortion, but provide needed indication of trends and stability.

2. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.
3. Both analog and digital metering are required.

D. Generator Set Alarm and Status Display.
1. The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing warning and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of all alarm, shutdown, and status conditions associated with the generator set, including all paralleling control functions and the engine ECM on an alphanumerical display on the genset. The following alarm, shutdown, and status conditions are required, as a minimum:
   a. low oil pressure (alarm)
   b. low oil pressure (shutdown)
   c. oil pressure sender failure (alarm)
   d. low coolant temperature (alarm)
   e. high coolant temperature (alarm)
   f. high coolant temperature (shutdown)
   g. engine temperature sender failure (alarm)
   h. low coolant level (alarm or shutdown--selectable)
   i. fail to crank (shutdown)
   j. fail to start/overcrank (shutdown)
   k. overspeed (shutdown)
   l. low DC voltage (alarm)
   m. high DC voltage (alarm)
   n. weak battery (alarm)
   o. low fuel-daytank (alarm)
   p. high AC voltage (shutdown)
   q. low AC voltage (shutdown)
   r. under frequency (shutdown)
   s. over current (warning)
   t. over current (shutdown)
   u. short circuit (shutdown)
   v. ground fault (alarm)
   w. over load (alarm)
   x. emergency stop (shutdown)
2. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

E. Engine Status Monitoring.
1. The following information shall be available from a digital status panel on the generator set control :
   a. engine oil pressure (psi or kPA)
   b. engine coolant temperature (degrees F or C)
   c. engine speed (rpm)
   d. number of hours of operation (hours)
   e. number of start attempts
   f. battery voltage (DC volts)

2. The control system shall also incorporate a data logging and display provision to allow logging of a minimum of the last 20 warning or shutdown indications on the generator set, the time of the last fault of each type, and the number of faults of each type, and total time of operation at various loads as a percent of the standby rating of the generator set.

F. Engine Control Functions.
1. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
2. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
3. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
4. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.

G. Alternator Control Functions:
1. The generator set shall include an automatic microprocessor-based voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The voltage regulation system shall be based on a full wave rectified input, pulse-width modulated output design. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.
2. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA 70 Article 445.
3. Controls shall be provided to individually monitor all three phases of the output current for 1, 2, or 3-phase short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown).
4. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
5. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under

voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.

6. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32 VDC[3]. During engine cranking (starter engaged), the low voltage limit shall be disabled, and if DC voltage drops to less than 14.4 volts for more than two seconds a "weak battery" alarm shall be initiated.

H. Provide and install a 20-light LED type remote alarm annunciator with horn, located as shown on the drawings or in a location that can be conveniently monitored by facility personnel. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for level 1 systems; and in addition shall provide indications for high battery voltage, low battery voltage, loss of normal power to the charger. Spare lamps shall be provided to allow future addition of other alarm and status functions to the annunciator. Provisions for labeling of the annunciator in a fashion consistent with the specified functions shall be provided. Alarm silence and lamp test switch(es) shall be provided. LED lamps shall be replaceable, and indicating lamp color shall be capable of changes needed for specific application requirements. Alarm horn shall be switchable for all annunciation points. Alarm horn (when switched on) shall sound for first fault, and all subsequent faults, regardless of whether first fault has been cleared, in compliance with NFPA110 3-5.6.2.

I. The generator set shall be provided with a utility grade protective relay, designed to provide thermal overload protection for the alternator, and performance certified for that purpose by a 3rd party testing organization. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided. Relay shall be installed to allow shutdown of the generator excitation system on an alternator overload condition, with the engine operating for a cool-down period before shutdown. The relay shall not include an instantaneous trip function.

J. Control Interfaces for Remote Monitoring:

1. No field connections for control devices shall be made in the AC power output enclosure. Provide the following features in the control system:
2. Form "C" dry contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.
3. One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
4. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
5. A fused 20 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
6. The generator set shall be provided with a network communication module to allow real time communication with the generator set control by a remote monitoring system. Protocol for communication shall be Modbus RTU. The control shall communicate all engine and alternator data; alarm, shutdown and status conditions.

PART 3 - OTHER REQUIREMENTS

3.1 PROTOTYPE TESTING

A. Submit evidence of prototype testing; manufacturer’s certificate etc.

[3] For 12VDC nominal voltage systems, use Undervoltage at 8VDC and overvoltage at 16VDC.

3.2 FACTORY TESTING.

A. The generator set manufacturer shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. All testing shall be performed with calibrated metering.

B. Factory testing may be witnessed by the owner and consulting engineer.

C. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include:
1. Reactive Load Bank Testing, 4 hours at 100% load.
2. Standard factory test procedures" maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.
3. Provide a certified copy of the testing to the engineer after shipment

3.3 INSTALLATION

A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

C. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

D. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.

E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

F. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.4 ON-SITE ACCEPTANCE TEST:

A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. Tests shall include:

B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.

C. Installation acceptance tests to be conducted on-site shall include a "cold start" test and a one-step rated load pickup test in accordance with NFPA 110. Load bank testing at the following intervals: 4 hours at 100% load. Provide a resistive load bank and make temporary connections.

D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system. Coordinate timing and obtain approval for start of test with site personnel.

E. The generator set supplier shall issue a test report documenting the results of testing, and including a complete list of all settings in the control system.

3.5 TRAINING

A. The equipment supplier shall provide on-site training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner. If the Owner desires, training may be held on a date other than a day the equipment is tested, commissioned or placed in service, at no additional cost.

3.6 SERVICE AND SUPPORT

A. Provide (5) sets of operation and maintenance manuals for the equipment supplied.

B. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The inventory shall have a commercial value of $3 million or more. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.

C. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 40 miles of the site.

D. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

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SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

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 types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Source quality-control test reports.

C. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

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 IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.8 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Electric Company.
2. Square D.
3. Eaton, Cutler-Hammer
4. Siemens Energy & Automation

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Enclosure: Ventilated, NEMA 250, Type 3R.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

G. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

H. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

I. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

J. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.
3. Shield Effectiveness:
    a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
    b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
    c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

K. Wall Brackets: Manufacturer's standard brackets.

L. Low-Sound-Level Requirements: Maximum sound levels, when factory tested according to IEEE C57.12.91, as follows:

1. 9 kVA and Less: 40 dBA
2. 30 to 50 kVA: 45 dBA
3. 51 to 150 kVA: 50 dBA
4. 151 to 300 kVA: 55 dBA
5. 301 to 500 kVA: 60 dBA
6. 501 to 750 kVA: 62 dBA
7. 751 to 1000 kVA: 64 dBA

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in Division 26 Section "Hangers and Supports for Electrical Systems."

C. Suspend transformers as shown on Electrical details sheet and as per manufacturer’s drawings.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

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. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 26 22 00

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SECTION 26 24 16

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. Load centers.
4. 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. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.

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.

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. Altitude: Not exceeding 6600 feet.

B. 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 seven days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.
3. 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.

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.
c. Wash-Down Areas: NEMA 250, Type 4X stainless steel.

2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor. Provide as indicated on the drawings.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections. Provide as indicated on the drawings.
5. 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.

6. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover. Directory card shall be computer generated.

B. Incoming Mains Location: Top and bottom.

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.

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: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

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: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D-ILINE or comparable product by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
2. Eaton, Cuttler-Hammer
3. Siemens Energy & Automation

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Mains: Provide as indicated on the drawings.

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D-NQ/NF or comparable product by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
2. Eaton, Cuttler-Hammer
3. Siemens Energy & Automation

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Provide as indicated on the drawings.

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. 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, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) 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. Fabrication using bolted compression lugs for internal wiring.
   b. Integral disconnect switch.
   c. Redundant suppression circuits.
   d. Redundant replaceable modules.
   e. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
   f. LED indicator lights for power and protection status.
   g. Audible alarm, with silencing switch, to indicate when protection has failed.
   h. 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.
   i. 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: 70,000A.
   b. Line to Ground: 70,000A.
   c. Neutral to Ground: 50,000A.
4. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 or 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.
5. Protection modes and UL 1449 SVR for 240/120-V, single-phase, three-wire circuits shall be as follows:

   a. Line to Neutral: 400 V.
   b. Line to Ground: 400 V.
   c. Neutral to Ground: 400 V.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D overcurrent devices or comparable product by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents. Provide ratings as indicated on the drawings.

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. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
6. 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.
    d. Ground-Fault Protection: [Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
    f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    g. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.5 PANELBOARD SUPPRESSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D Surelogic or comparable product by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:
    a. Fabrication using bolted compression lugs for internal wiring.
    b. Integral disconnect switch.

c. Redundant suppression circuits.
d. Redundant replaceable modules.
e. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
f. LED indicator lights for power and protection status.
g. Audible alarm, with silencing switch, to indicate when protection has failed.
h. 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.
i. 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: 70,000A.
b. Line to Ground: 70,000A.
c. Neutral to Ground: 50,000A.

4. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 or 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.

5. Protection modes and UL 1449 SVR for 240/120-V, single-phase, three-wire circuits shall be as follows:

a. Line to Neutral: 400 V.
b. Line to Ground: 400 V.
c. Neutral to Ground: 400 V.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according 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 to 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 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. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

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: 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. 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. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. 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.

END OF SECTION 26 24 16

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SECTION 26 27 26

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. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Tamper-resistant receptacles.
5. Weather-resistant receptacles.
6. Snap switches and wall-box dimmers.
7. Solid-state fan speed controls.
8. Wall-switch and exterior occupancy sensors.
9. Communications outlets.
10. Pendant cord-connector devices.
11. Cord and plug sets.
12. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

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. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, 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 NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HBL5361 (single), HBL5362 (duplex).
   b. Pass & Seymour; 5361A (single), 5362A (duplex).

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; IG5362.
   b. Pass & Seymour; IG5362.

2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

C. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HBL8300SGA.
   b. Pass & Seymour; TR63H.
2. Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; GFR5362SG.
   b. Pass & Seymour; 2095.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; GFTR20.
   b. Pass & Seymour; 2095TR.

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.6 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.

3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Single Pole:
      1) Hubbell; HBL1221.
      2) Pass & Seymour; PS20AC1.
   b. Two Pole:
      1) Hubbell; HBL1222.
      2) Pass & Seymour; PS20AC2.
   c. Three Way:
      1) Hubbell; HBL1223.
      2) Pass & Seymour; PS20AC3.
   d. Four Way:
      1) Hubbell; HBL1224.
      2) Pass & Seymour; PS20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HBL1201PL for 120 and 277 V.
   b. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HBL1221L.
   b. Pass & Seymour; PS20AC1-L.
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HBL1557.
   b. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HBL1557L.
   b. Pass & Seymour; 1251L.

2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces (Stainless Steel): [Steel with white baked enamel, suitable for field painting] [Smooth, high-impact thermoplastic] 0.035-inch- thick, satin-finished stainless steel[thick, brushed brass with factory polymer finish] [thick anodized aluminum] [thick steel with chrome-plated finish].
3. Material for Unfinished Spaces (Stainless Steel): 0.035-inch- thick, satin-finished stainless steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.9 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, die-cast aluminum with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.10 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand.

B. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service-Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks complying with requirements in Division 27 Section "Communications Horizontal Cabling."
4. Size: Selected to fit nominal 3-inch cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused 3-inch cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of two, four-pair cables that comply with requirements in Division 27 Section "Communications Horizontal Cabling."

2.11 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Verify with Architect, unless otherwise indicated or required by NFPA 70 or device listing.
2. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: Match device.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. 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 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 right 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 devices that have been in temporary use during construction and that 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, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by 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, and on horizontally mounted receptacles to the right.

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.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles (Outside and Inside): Identify panelboard and circuit number from which served. Use hot, stamped phenolic or engraved machine printing with black (for normal powered receptacles) or red-filled lettering (for emergency powered receptacle) on face of plate, and durable wire markers or tags inside outlet boxes.
2. Receptacles (Inside Only): At each device identify the panel and circuit number to which the device is finally connected in indelible ink on the inside of the device coverplate and on the inside of the outlet box.
3. Switches: Where more than two switches are located within 8” of each other on a wall, provide permanent labels indicating switch function.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
3. Using the test plug, verify that the device and its outlet box are securely mounted.
4. 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 hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 26 27 26

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SECTION 26 36 00

TRANSFER SWITCHES

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.

B. Specification Section 26 09 13 – Emergency/Standby Generator Sets.

C. Specification Section 26 23 13 – Emergency/Standby Generator Sets Paralleling Equipment.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:
   1. Automatic transfer switches.
   2. Bypass/isolation switches.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
   1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product 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. Features and operating sequences, both automatic and manual.
   2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches and bypass/isolation switches through one source from a single manufacturer. Furthermore, automatic transfer switches, emergency/standby generator sets and generator set paralleling equipment shall be obtained through one source from a single manufacturer.

C. 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.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 110.

G. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Contactor Transfer Switches:
      a. Onan/Cummins Power Generation; Industrial Business Group
      b. Caterpillar; Engine Div.
      c. MTU Onsite Energy

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
   1. Switch Action: Double throw; mechanically held in both directions.
   2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 26 Section "Identification for Electrical Systems."
   1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
   2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
   3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

J. Bypass isolation.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5 seconds, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

F. Automatic Transfer-Switch Features:
   1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
   2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
   3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
   4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
   5. Test Switch: Simulate normal-source failure.
   6. Switch-Position Pilot Lights: Indicate source to which load is connected.
   7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.
    1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."

B. Identify components according to Division 26 Section "Identification for Electrical Systems."

C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to conduct testing.
   2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
   3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
      a. Check for electrical continuity of circuits and for short circuits.
      b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
      c. Verify that manual transfer warnings are properly placed.
      d. Perform manual transfer operation.
   5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
      a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
      b. Verify time-delay settings.
      c. Verify pickup and dropout voltages by data readout or inspection of control settings.
      d. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
      e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

B. Coordinate tests with tests of generator sets and generator set paralleling equipment and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

E. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
   1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
   2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01 Section "Demonstration and Training."

B. Coordinate this training with that for generator sets and generator set paralleling equipment.

END OF SECTION 26 36 00

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SECTION 264113

LIGHTNING PROTECTION FOR STRUCTURES

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 lightning protection for structures, structure elements, and building site components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air terminals and mounting accessories.
   1. Layout of the lightning protection system, along with details of the components to be used in the installation.
   2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

B. Certification, signed by Contractor, that roof adhesive is approved by manufacturer of roofing material.

C. Field quality-control reports.

D. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems," for maintenance of the lightning protection system.

E. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:
   1. Ground rods.
   2. Ground loop conductor.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Certified by UL, trained and approved for installation of units required for this Project.

B. System Certificate:
   1. UL Master Label.
   2. UL Master Label Recertification.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

1.6 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

C. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

1.7 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780.

B. Roof-Mounted Air Terminals: NFPA 780, Class I, aluminum unless otherwise indicated.
   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. East Coast Lightning Equipment Inc.
      b. ERICO International Corporation.
      c. Harger.
      d. Heary Bros. Lightning Protection Co. Inc.
      e. Independent Protection Co.
      f. Preferred Lightning Protection.
      g. Robbins Lightning, Inc.
      h. Thompson Lightning Protection, Inc.
   2. Air Terminals More than 24 Inches Long: With brace attached to the terminal at not less than half the height of the terminal.
   3. Single-Membrane, Roof-Mounted Air Terminals: Designed specifically for single-membrane roof system materials. Comply with requirements in roofing Sections.

C. Main and Bonding Conductors: Copper.

D. Ground Loop Conductor: The same size and type as the main conductor except tinned.

E. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet long.

F. Heavy-Duty, Stack-Mounted, Lightning Protection Components: Stainless steel.

1.8 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780.

B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.

C. Conceal the following conductors:
   1. System conductors.
   2. Down conductors.
   3. Interior conductors.
   4. Conductors within normal view of exterior locations at grade within 200 feet of building.

D. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system.

E. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.

F. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot intervals.

1.9 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 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

1.10 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

1.11 FIELD QUALITY CONTROL

A. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.

B. UL Inspection: Meet requirements to obtain a UL Master Label for system.

END OF SECTION 26 41 13

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SECTION 26 51 19

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 26 09 26"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. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of luminaire.

C. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

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 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.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 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 years from date of Substantial Completion.

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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. CRI of minimum 80. CCT of 3500K.

G. Rated lamp life of at least 50,000 hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

J. Nominal Operating Voltage: 120 V ac.

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

K. Housings:

1. Extruded-aluminum housing and heat sink.

2.2 DOWNLIGHT

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Acuity Brands Lighting, Inc.
2. Cooper Lighting.
3. Philips Lighting.

B. Minimum 1500 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Universal mounting bracket.

D. Integral junction box with conduit fittings.

2.3 RECESSED LINEAR

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Acuity Brands Lighting, Inc.
2. Cooper Lighting.
3. Philips Lighting.

B. Minimum 3000 lumens. Minimum allowable efficacy of 85 lumens per watt.

C. Integral junction box with conduit fittings.

2.4 STRIP LIGHT

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Acuity Brands Lighting, Inc.
2. Cooper Lighting.
3. Philips Lighting.

B. Minimum 3000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.5 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. 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.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.

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.

2.6 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.

2.7 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "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 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.

D. Rod Hangers: 3/16-inch 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.
2. Do not attach luminaires directly to gypsum board.

G. 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.

H. Comply with requirements in Section 26 05 19 "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 26 05 53 "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 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 26 51 19

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SECTION 26 52 19

EMERGENCY AND EXIT 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. Emergency lighting units.
2. Exit signs.
3. Luminaire supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Fixture: See "Luminaire" Paragraph.

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 emergency lighting unit, exit sign, and emergency lighting support.

1. Include data on features, accessories, and finishes.
2. Include physical description of the unit and dimensions.
3. Battery and charger for light units.
4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.
    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. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.

2. For exit signs. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program 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 National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 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. Warranty Period: 5 year(s) from date of Substantial Completion.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Power Unit Batteries: 5 years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining four years.
2. Warranty Period for Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

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: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.

C. Comply with NFPA 70 and NFPA 101.

D. Comply with NEMA LE 4 for recessed luminaires.

E. Comply with UL 1598 for fluorescent luminaires.

F. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast/driver.

1. Emergency Connection: Operate one lamp(s) continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    a. Ambient Temperature: Less than 0 deg For exceeding 104 deg F, with an average value exceeding 95 deg Fover a 24-hour period.
    b. Ambient Storage Temperature: Not less than minus 4 deg Fand not exceeding 140 deg F.
    c. Humidity: More than 95 percent (condensing).
    d. Altitude: Exceeding 3300 feet
4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
5. Battery: Sealed, maintenance-free, nickel-cadmium type.
6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
7. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 EMERGENCY LIGHTING

A. General Requirements for Emergency Lighting Units: Self-contained units.

B. Emergency Luminaires:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    a. Acuity Brands Lighting, Inc.

b. Cooper Lighting.
c. Philips Lighting.

2. Emergency Luminaires: As indicated on Drawings, with the following additional features:
   a. Operating at nominal voltage of 120 V ac. Coordinate requirements below with "Emergency Power Units" Article.
   b. Internal emergency power unit.
   c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.

2.3 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Acuity Brands Lighting, Inc.
   b. Cooper Lighting.
   c. Philips Lighting.
2. Operating at nominal voltage of 120 V ac.
3. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
4. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

2.4 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:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.5 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. 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.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 and emergency power unit weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.

E. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

F. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
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.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. 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.

3.5 STARTUP SERVICE

A. Perform startup service:

1. Charge batteries minimum of one hour and depress switch to conduct short-duration test.
2. Charge batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect all luminaires. Replace lamps, batteries, signs, or luminaires that are defective.
   a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 26 52 19

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SECTION 26 56 13

LIGHTING POLES AND STANDARDS

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. Poles and accessories for support of luminaires.

1.3 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete lighting fixture.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.4 ACTION SUBMITTALS

A. Product Data: For each pole arranged as indicated.

1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
2. Include finishes for lighting poles and luminaire-supporting devices.
3. Anchor bolts.
4. Manufactured pole foundations.

1.5 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For poles to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include pole inspection and repair procedures.

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1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Pole repair materials.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for foundation testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below finished grade.

D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

E. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: Five years from date of Substantial Completion.
2. Warranty Period for Corrosion Resistance: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design pole foundation and pole power system.

B. Structural Characteristics: Comply with AASHTO LTS-6-M.

C. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.

D. Live Load: Single load of 500 lbf distributed according to AASHTO LTS-6-M.

E. Ice Load: Load of 3 lbf/sq. ft., applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

F. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.

G. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.

H. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 STEEL POLES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Acuity Brands Lighting, Inc.
2. Cooper Lighting.
3. Philips Lighting.

B. Source Limitations: Obtain poles from single manufacturer or producer.

C. Source Limitations: For poles, obtain each color, grade, finish, type, and variety of pole from single source with resources to provide products of consistent quality in appearance and physical properties.

D. Poles: Comply with ASTM A 500/A 500M, Grade B carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: Square, straight.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

E. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

F. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

G. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

H. Intermediate Handhole and Cable Support: Weatherproof, 3-by-5-inch handhole located at midpoint of pole, with cover for access to internal welded attachment lug for electric cable support grip.

I. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.

J. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

K. Galvanized Finish: After fabrication, hot-dip galvanize according to ASTM A 123/A 123M.

L. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces according to 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, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. 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.

M. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Powder Coat: Comply with AAMA 2604.
    a. Electrostatic-applied powder coating; single application and cured to a minimum 2.5- to 3.5-mils dry film thickness. Coat interior and exterior of pole for equal corrosion protection.

2.3 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE INSTALLATION

A. Alignment: Align poles as indicated.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing.

1. Fire Hydrants and Water Piping: 60 inches

2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.4 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundation.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Inspect poles for nicks, mars, dents, scratches, and other damage.
2. System function tests.

END OF SECTION 26 56 13

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SECTION 26 56 19

LED 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 26 56 13 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

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, and 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. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.8 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.

1.9 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: Five years 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. L70 lamp life of at least 50,000 hours.

F. Lamps dimmable from 100 percent to 0 percent of maximum light output.

G. Internal driver.

H. Nominal Operating Voltage: 120 V ac.

I. In-line Fusing: On the primary for each luminaire.

J. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

K. Source Limitations: Obtain luminaires from single source from a single manufacturer.

L. 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. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Acuity Brands Lighting, Inc.
2. Cooper Lighting.
3. Philips Lighting.

B. Area and Site:

1. Luminaire Shape: Square.
2. Mounting: Pole with extruded-aluminum arm.
3. Luminaire-Mounting Height: 20’.
4. Distribution: Type IV.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

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. Doors shall be removable for cleaning or replacing lenses.

C. 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 minimum unless otherwise indicated.

D. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

E. 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.

F. 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.

G. 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: Dark bronze.

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.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "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, 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 to structural members in walls.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Coordinate layout and installation of luminaires with other construction.

I. Comply with requirements in Section 26 05 19 "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 according to Pole Detail at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "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 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-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 26 05 53 "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:

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. Luminaire will be considered defective if it does not pass tests and inspections.

D. 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. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

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 26 56 19

SECTION 270000
COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general design requirements, administration topics, and installation for communications systems.

1.2 SYSTEM DESCRIPTION

A. The objective of this project is to provide a complete communications cabling infrastructure system installation including, but not limited to: fiber backbone, riser system, horizontal data and voice cabling with attendant terminations, mounting equipment, cable pathway and management systems, testing and other items/materials, as specified in drawings, these specifications, and contract documents.

B. Related Sections
1. Section 260000 Electrical (including related sub-sections)
2. Section 270526 Grounding and Bonding for Communications Systems
3. Section 270543 Underground Ducts & Raceways
4. Section 271100 Communications Equipment Room Fittings
5. Section 271300 Communications Backbone Cabling
6. Section 271500 Communications Horizontal Cabling
7. Section 280000 Electronic Security (including related sub-sections)

1.3 SCOPE OF WORK

A. This section establishes an infrastructure to be used as signal pathways for communications systems, but is not limited to the following:
1. Comply with all Project Contract documents and the following requirements for a complete project installation.
2. Provide a structured cabling system as described hereafter that includes, but is not limited to, supplying, installing and testing of: backbone cabling, riser cabling; data and voice horizontal cabling, cable connectors, communications outlets and terminations, and equipment racks/cabinets for networking hardware and patch panels.
3. Furnish all labor, materials, tools, equipment and services for the installation described herein.
4. Follow industry standard installation procedures for communications cable to assure that the mechanical and electrical transmission characteristics of this cable plant and equipment are maintained.

B. Work of this section covers complete installation of permanent links for a data and voice communications networks utilizing copper and fiber transmission media that includes, but is not limited to the following:
1. Provide, install, terminate, test, and document all fiber and copper backbone cables, riser cables, and horizontal cables.
2. Provide and install all termination devices such as, but not limited to, modular patch panels, termination blocks, information outlets (jacks and plates), phone jacks, fiber distribution panels, bulkheads, connectors, and fiber fan out kits. Document all termination devices with proper labeling.

3. Provide in quantities specified, interconnect components such as, but not limited to, fiber patch cables, copper patch cords, and station cables.
4. Provide and install specified Telecommunication Room equipment such as, but not limited to, racks, cabinets, horizontal and vertical cable support devices, cable trays and cable runway, and required mounting brackets/hardware.
5. Provide and install UL-approved firestopping systems in all communication pass-through locations of rated ceiling, wall or floor penetrations involving, conduits, cable, and cable trays in coordination with General Contractor.
6. Provide and install grounding and bonding connection to the bus (PBB/SBB) provided by Division 26.
7. Provide and install all appropriate consumable items required to complete the installation.
8. Coordination with other trades.
9. Provide complete documentation and demonstration of work.
10. Provide indexed and organized complete Test Results of all copper and fiber cable and their components in native format.
11. Provide Submittals as outlined below.
12. Provide a Manufacturer's Extended Product Warranty and System Assurance Warranty for this wiring system.
13. Conduct a final document handover meeting with client, consultant, and PM to review, discuss and educate the Owner on the final product, test results, and As-Built Drawings.

C. Changes to the Scope of Work
1. Owner changes to the scope of work shall be in writing.
2. Change orders shall be submitted to the Owner/Project Manager complete with price breakdown and description for approval before any work is done.
3. The Contractor shall respond to these changes with a complete material list, including pricing, labor, and taxes in writing to be presented to the Owner for approval.
4. The Contractor shall not proceed with additional scope of work without signed approval by the Owner. Owner will not pay for additional work performed by the Contractor without written/signed approval of these changes.
5. Contractor will attach a copy of the signed change order with billing information.

1.4 PRODUCTS AND WORK BY OTHERS (NIC)

A. The Owner may separately procure and/or provide certain equipment and component that will be installed during the course of project. Such items may not be indicated in the documents.

B. Contractor shall cooperate with the Owner and Owner's suppliers when considering:
1. The provision and installation of phone systems, related system equipment/software, and employee station equipment/software.
2. The provision and installation of multi-port routers, switches, and other Layer 2 / Layer 3 networking components in communications rooms.
3. The provision and installation of Uninterruptable Power Source (UPS) devices in communications rooms.
4. Communications grounding busbars and grounding wires connecting to the main building electrode system.
5. Dedicated power panels, ground busbars, circuits, and utility outlets.
6. The installation and finishing of plywood backboards.
7. Building mechanical ductwork, cooling/heating system (HVAC), and environmental control sensors.
8. Communication pathway devices such as, but not limited to, cable tray and flex-tray in corridors, office spaces and open areas, outlet boxes and stub-ups, conduits, conduit sleeves, and penetrations in walls and floors.

1.5 SUBSTITUTION PROCEDURES

A. Substitution may be considered when a product becomes unavailable through no fault of the Contractor. An alternate product must be equal to or exceed specified requirements. The material substituted shall not void, alter or change manufacturers' structured cabling system warranty.

B. Document substitution requests with complete data substantiating compliance of proposed substitution with Contract Documents. Include in each request for substitution:
   1. Product identification, manufacturer's name and address.
   2. Product Data:
      a. Description, performance and test data, reference standards, finishes and colors.
      b. Samples: Finishes.
      c. Complete and accurate drawings indicating construction revisions required (if any) to accommodate substitutions.
      d. Data relating to changes required in construction schedule.
      e. Cost comparison between specified and proposed substitution.

C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

D. The Owner will be the final judge of acceptability, with review by DataCom Design Group and the distribution of the acceptance by the Architect.

E. No substitute shall be ordered, installed or utilized without the Architect's prior written verification of acceptance from the Owner.

1.6 REFERENCES AND RELATED DOCUMENTS

A. Drawings and General provisions of the contract, including Uniform General Conditions, Supplementary General Conditions, Architectural plans and specifications, requirements of Division 1, Electrical, Mechanical, Plumbing, Audio-Visual, Security and Communications specifications and plans, and the publications listed below apply to the Communications section, are incorporated into this specification by reference, and shall be considered a part of this section.

B. Reference to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean reference to the latest printed edition of each in effect at the date of contract.

C. The Contractor shall read all sections in their entirety and apply them as appropriate for work in this section.

D. Conflicts
   1. Drawings and specifications are to be used in conjunction with one another and to supplement one another.
   2. In general, the specifications determine the nature and quality of the materials and tests, and the drawings establish the quantities, details, and give characteristics of performance that should be adhered to during the installation of the communications system components.
   3. If there is an apparent conflict between the drawings and specifications, or between specification sections, the items with the greater quantity and/or quality shall be estimated and installed.
   4. Clarification with the Owner and/or DataCom Design Group about these items shall be made in writing prior to procurement and installation.

E. Codes and Standards
1. American National Standards Institute/Telecommunications Industry Association (ANSI/TIA)
   a. ANSI/TIA-568.0-D "Generic Telecommunications Cabling for Customer Premises"
   b. ANSI/TIA-568.1-D "Commercial Building Telecommunications Infrastructure Standard"
   c. ANSI/TIA-568.2-D "Balanced Twisted-Pair Telecommunication Cabling and Components Standard"
   d. ANSI/TIA-568.3-D "Optical Fiber Cabling Components Standard"
   e. ANSI/TIA-568.4-D "Broadband Coaxial Cabling and Components Standard"
   f. ANSI/TIA-569-D "Telecommunications Pathways and Spaces"
   g. ANSI/TIA-606-C "Administration Standard for Commercial Telecommunications Infrastructure"
   h. ANSI/TIA-607-C "Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications"
   i. ANSI/TIA-758-C "Customer-Owned Outside Plant Telecommunications Infrastructure Standard"
   j. ANSI/TIA-862-B “Building Automation Systems Cabling Standard”
   k. ANSI/TIA-942-A: “Telecommunications Infrastructure Standard for Data Centers”
   l. ANSI/TIA-1152-A: “Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling”
2. American National Standards Institute (ANSI)
   a. ANSI C80.1 Electrical rigid steel conduit (ersc)
3. American Society for Testing Materials (ASTM)
   a. ASTM A123/A123M-13 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   b. ASTM A510/A510M-13 Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
   c. ASTM A653/A653M-13 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   d. ASTM B3-13 Standard Specification for Soft or Annealed Copper Wire
   e. ASTM B8-11 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   f. ASTM B33-10 Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
   g. ASTM B633-13 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
   h. ASTM B653/B653M-11 Standard Specification for Seamless and Welded Zirconium and Zirconium Alloy Welding Fittings
4. BICSI
   a. BICSI Outside Plant Design Reference Manual
   b. BICSI Telecommunications Distribution Methods Manual (TDMM)
5. Federal Specifications (FS)
   a. FS W-C-58C Conduit Outlet Boxes, Bodies Aluminum and Malleable Iron
   b. FS W-C-1094 Conduit and Conduit Fittings Plastic, Rigid
   c. FS WW-C-566C Flexible Metal Conduit
   d. FS WW-C-581D Coatings on Steel Conduit
6. Institute of Electrical and Electronic Engineers (IEEE)
   a. IEEE 142-1991 Recommended Practice for Grounding of Industrial and Commercial Power Systems
   b. IEEE 1100-2005 IEEE Recommended Practice for Powering and Grounding Electronic Equipment
7. National Electrical Code (NEC)
   a. NEC Article 250 - Grounding and Bonding
   b. NEC Chapter 8 - Communications Systems

8. National Electrical Manufacturers Association (NEMA)
   a. NEMA RN1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
   b. NEMA TC2 Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
   c. NEMA TC3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
   d. NEMA VE 1 - Metal Cable Tray Systems
   e. NEMA VE 2 - Cable Tray Installation Guidelines
9. Underwriters' Laboratories (UL)
   a. UL Cable Certification and Follow-Up Program
   b. UL 6: Electrical Rigid Metal Conduit - Steel
   c. UL 83: Thermoplastic-Insulated Wires and Cables
   d. UL 467: Grounding and Bonding Equipment
   e. UL 514B: Conduit, Tubing, and Cable Fittings
   f. UL 651: Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
   g. UL 651A: Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit
   h. UL 1666: Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
10. Local, county, state and federal regulations and codes in effect as of date of installation.
11. Equipment of foreign manufacture must meet U.S. codes and standards.
    a. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

1.7 QUALITY ASSURANCE

A. Communications Contractor shall have a complete working knowledge of low voltage communications cabling applications such as, but not limited to data, voice and video network systems.

B. Communications Contractor shall have installed similar-sized systems in at least ten (10) other projects in the last five (5) years prior to this bid and be regularly engaged in the business of installation of the types of systems specified in this document.

C. Communications Contractor and individual installation crew members shall be experienced and qualified to perform the work specified herein at time of bid submission. All onsite supervision personnel that will be assigned to this project shall be listed in the Pre-Installation Submittal.
   1. 80% shall have a minimum of three (3) years of experience in the installation of the types of systems, equipment, and cables specified in this document prior to this bid.
   2. All installation team members must demonstrate knowledge and compliance with all applicable methods, standards, and codes.
   3. All members of the installation team shall be certified by the Structured Cabling System Assurance Warranty provider as having completed the necessary training to complete their part of the installation and capable of an installation that falls under manufacturer’s guidelines necessary to obtain the Manufacturer’s System Assurance Warranty.
   4. Any personnel substitutions shall be noted in writing to the Owner.

D. A BICSI RCDD shall supervise and approve all on-site work as a recognized member of the Contractor’s installation team.

E. Refer also to General Conditions.

1.8 CONTRACTOR REQUIREMENTS

A. In order to accomplish the conditions of this agreement, the Contractor shall perform the specific duties listed herein.

B. Contractor shall provide and pay for all labor, supervision, tools, equipment, test equipment, tests and services to provide and install a complete communications cabling infrastructure system. Pay all required sales, gross receipts, and other taxes.

C. Insurance
1. The Contractor shall procure, submit for review, and maintain for the duration of this agreement, insurance against claims for injuries to persons or damages to property which may arise from, or in connection with, the performance of work hereunder by the Contractor, his agents, representatives, employees or subcontractor. The Contractor shall pay the cost of such insurance.
2. The Owner, its directors, officers, representatives, agents and employees, respectively, shall have no responsibility to the Contractor with respect to any insurance in accordance with the provisions set forth herein.

D. Regulatory Requirements
1. Communications Contractor shall supply all city, county, and state telecommunication cabling permits required by Authority Having Jurisdiction (AHJ).
2. Communications Contractor shall be licensed and/or bonded as required for telecommunications/low voltage cabling systems.

E. Privacy and Confidentiality
1. The Contractor will respect and protect the privacy and confidentiality of Owner, its employees, processes, products, and intellectual property to extent necessary, consistent with the legal responsibilities of the Owner policies.
2. Contractors shall sign a non-disclosure agreement and abide by the requirements to keep confidential all information concerning bid documents and this project.

F. Use of Subcontractors
1. Successful bidder shall inform the Owner's contact and General Contractor in writing about the intention to use Subcontractors and the scope of work for which they are being hired.
2. The Owner or Owner's designated contact must approve the use of Subcontractors in writing prior to the Subcontractor's hiring and start of any work.

G. The Contractor's designated Project Manager will be recognized as the single point of contact. The Project manager shall oversee all work performed to ensure compliance with specifications as outlined in bid documents (which includes all specifications, references, and drawings) to ensure a quality installation and attend project meetings with the telecommunication consultant, the Owner and others.

H. Coordination
1. Coordinate installation work with other trades (examples include ceiling grid contractors, HVAC and sheet metal contractors, etc.) to resolve procedures and installation placement for cable trays and cable bundle pathways.
2. The goal of this coordination will be to establish priority pathways for critical data/voice network cable infrastructure, materials, associated hardware, as well as mitigate delays to the project and to allow service access for communications and HVAC components.
3. Exchange information and agree on details of equipment arrangements and installation interfaces.
4. Coordinate with electrical contractors and plan for the pathway routes used communications cabling to minimize cable lengths. Report any potential over distance cable runs for approval before pulling the cables.
5. Record agreements with other trades and distribute record to other participants, Owner and telecommunication consultant.

1.9 PRE-INSTALLATION MEETINGS

A. Communications Contractor shall attend and/or arrange a scheduled pre-installation conference prior to beginning any work of this section. This venue is to ask and clarify questions in writing with consultant and/or project manager/Owner representative.

B. Agenda
1. Safety
2. Work to be performed
3. Scheduling
4. Coordination
5. Other topics as necessary

C. Attendance
1. Communications project manager/supervisor shall attend meetings arranged by General Contractor, Owner's representatives, and other parties affected by work of this document.
2. All individuals who will serve in an on-site supervisory capacity, including project managers, site supervisors, and lead installers, shall be required to attend the pre-installation conference. Individuals who do not attend the conference will not be permitted to supervise the installation and testing of communications cables on the project.

1.10 CONTRACT ADMINISTRATION

A. DataCom Design Group may perform site visits and provide job field reports upon inspection of Contractor's installation, materials, supporting hardware, coordination with other trades and progress to schedule to the client.

B. Job Field Report outline:
1. General: The general installation progress in relation to scheduled work made by the Contractor up to that date.
2. Deficiencies and/or Items of Note: Documents observations of the cable installation that may require corrective action by the Contractor.

1.11 POST INSTALLATION MEETINGS

A. At the time of substantial completion the contractor shall call and arrange for a post installation meeting to present and review all submittal documents to include but not be limited to As-Built Drawings, Test reports, Warranty paperwork, etc.

B. Attendees shall include
1. Communications Contractor
2. Project Manager/Owner Representative
3. DataCom Design Group
4. General Contractor
5. Other trades that the GC deems appropriate.

C. At this meeting the Communications Contractor shall present and explain all documentation.

D. Any discrepancies or deviations noted by and agreed to by participants shall be remedied by the Communications Contractor and resubmitted within one (1) week of the meeting.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Coordination with delivery companies, drivers, site address, and contact person(s) will be the responsibility of the Contractor.

B. Communications Contractor requirements:
   1. Be responsible for prompt material deliveries to meet contracted completion date.
   2. Coordinate deliveries and submittals with the General Contractor to ensure a timely installation.
   3. No equipment materials shall be delivered to the job site more than three weeks prior to the commencement of its installation.
   4. Equipment shall be delivered in original packages with labels intact and identification clearly marked.
   5. Equipment shall not be damaged in any way and shall comply with manufacturer's operating specifications.
   6. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants.
   7. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owner.
   8. Contractor shall be responsible for all handling and control of equipment. Contractor is liable for any material loss due to delivery and storage problems.

C. Owner/General Contractor shall provide the security requirements for Contractor to follow.

1.13 PROJECT/SITE CONDITIONS

A. For all environmental recommendations, refer to master Architectural section.

B. For all security recommendations, refer to related consultant sections.

C. Contractor shall provide daily a clean work environment that is free from trash/rubbish accumulated during and after cabling installation.

D. Contractor shall keep all liquids (drinks, sodas, etc.) away from finished spaces. If any liquid or other detriment (cuts, soils, stains, etc.) damages any finishes, Contractor shall provide professional services to clean or repair scratched/soiled finishes, at Contractor's expense.

E. Damage by Communications Contractor to the work of others will be remedied at the Contractor's expense in a timely manner.

1.14 WARRANTY

A. The Contractor shall be a certified Manufacturer's Value Added Reseller (VAR) and/or Authorized Installer and provide an end-to-end product warranty, adhere to the industry standard engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this project.

B. Contractor shall coordinate with manufacturer for warranty paperwork and procedures prior to the start of the project.

C. Contractor shall provide a minimum one (1) year warranty on installation and workmanship PLUS an Extended Product Warranty and System Assurance Warranty for this wiring system and shall commit to make available local support for the product and system during the Warranty period.
   1. The Extended Product Warranty shall apply to all passive structured cabling system components and shall cover the replacement or repair of defective products and labor for the replacement or repair of such defective products for a minimum of one (1) year.
   2. The System Assurance Warranty provides a complete system and product warranty that will be extended to the end-user, ensuring the structured cabling system will be free of defects in materials and workmanship, will meet or exceed applicable performance

requirements defined in the contract documents, and support all current and future network applications for a minimum of twenty (20) years.

D. System Certification: Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturer, registering the installation.

1.15 PAYMENT

A. Refer to the General Contractor contract documents and/or master specifications issued by Architect for project and cost payment details.

1.16 SUBMITTALS

A. Refer to Requirements of Division 1.

B. The Communications Contractor shall not perform any portion of the work requiring submittal and review of shop drawings, product data, or samples until Owner has approved the respective submittal in writing. Such work shall be in accordance with approved submittals.

C. Pre-Installation Submittal Requirements
1. Communications Contractor shall provide certificates for the appropriate insurance coverage as defined in contract documents.
2. City, county, and/or state telecommunication cabling permits as required by Authority Having Jurisdiction (AHJ).
3. Executed non-disclosure agreement.
4. Appoint a Project Manager and provide the name and contact information.
5. Shop Drawings
   a. Communications Contractor shall submit, for approval, floor plans that identify all device locations, cable routes, cable lengths, cable quantities and cable types, riser locations, and references to installation details and diagrams.
      1) Communication Contractor shall notify Owner of cable routes exceeding standardized lengths.
   b. Communications Contractor shall submit, for approval, diagrams that show room layouts, rack layouts (including elevations), riser layouts, etc.
   c. The Contractor shall make any corrections as required by the consultant team and submit revised shop drawings to the team for approval.
   d. Approval by the Consultant of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from the drawings or specifications, nor shall it relieve the Contractor from responsibility for errors of any sort in shop drawings or schedules. Requests to deviate shall be submitted in writing to the Architect.
   e. Release of CAD Files
      1) Contractor may request to utilize the DataCom Design Group AutoCAD floor plan files for assistance in producing shop drawings.
      2) Request shall be made by signing the DataCom Design Group "Agreement for Release of CAD Files" letter.
6. Product Data Cut-sheets
   a. Communications Contractor shall submit catalogue cut-sheets that include manufacturer, trade name, and complete model number for each product specified. Model number shall be handwritten and/or highlighted to indicate exact selection.
   b. Communications Contractor shall identify applicable specification section reference for each product performance for each component specified for approval prior to purchase and installation.
7. Warranty

a. The Communications Contractor shall submit appropriate documentation from the certifying manufacturer showing the project is registered and qualified for the System Assurance Warranty.
b. All subsequent work shall be in accordance with approved submittals. The Communications Contractor shall not perform any portion of the work requiring approval of the System Assurance Warranty manufacturer's warranty registration qualification procedures that would disqualify any part or all of the wiring system from that warranty qualification.

8. Qualifications
   a. Communications Contractor shall submit a list of the Contractor's previous projects that demonstrate qualification for this project. This list shall include, but not be limited to:
      1) At least ten (10) other projects in the last five (5) years
      2) Name and location of project
      3) Project contacts, email addresses, and phone numbers
      4) Total square footage
      5) Total number of cables/drops
      6) Types of media
   b. Communications Contractor shall submit an up-to-date and valid statement of qualifications for those assigned to perform the work specified herein at time of bid submission.
      1) Communications Contractor Employees
      2) Subcontractors
   c. Manufacturer certifications for Contractor and installers.
9. Cable Testing Plan
   a. The Contractor shall provide a complete and detailed test plan for approval of the cabling system specified herein, including a complete list of test equipment for copper and fiber components and accessories prior to beginning cable testing.
   b. The following minimal items shall be submitted for review:
      1) A testing plan that clearly describes procedures and methods.
      2) Product data for test equipment.
      3) Certifications and qualifications of all persons conducting the testing.
      4) Calibration certificates indicating that equipment calibration meets National Institute of Standards and Technology (NIST) standards and has been calibrated at least once in the previous year of the testing date.
      5) Examples of test reports, including all graphs, tables, and charts necessary for display of testing results.
10. Samples
    a. For workstation outlet connectors, jack assemblies, housings and faceplates for color selection and evaluation of technical specifications and requirements. Confirm with Architect, interior designer, and Owner representative for color before purchasing materials.

D. Closeout Submittal Requirements
   1. As-Built Drawings
      a. Communications Design drawings are to be supplied to the Architect to prepare the master "As-Built" drawings.
      b. Submit one electronic copy and one hard copy with project deliverables within three (3) weeks subsequent to substantial completion. Provide a laminated floorplan with drop designations in the respective serving Telecom Room.
      c. As-Built drawings shall be in AutoCAD format, same version as used by Architect and consultant. Dimensions and scale of the drawing sheets submitted shall match the size of the drawing sheets used for the contract documents.
      d. Utilize normal recognized drafting procedures that match AutoCAD standards, Architect and Consultant guidelines, and methodology.

e. The As-Built drawings shall incorporate all changes made to the building identified in, but not limited to, addendum, change notices, site instructions or deviations resulting from site conditions.
   1) Contractor shall clearly identify any resubmitted drawing sheets, documents or cut sheets either by using a color to highlight or cloud around resubmitted information.
   2) Maintain drawing numbering or page/sheet scheme consistency as per previously issued drawings/documents.

f. Provide dimensioned plan and elevation views of networking components, showing:
   1) All work area outlet locations complete with outlet/cable labeling.
   2) Rack and/or cabinet locations complete with labeling.
   3) One-line diagram of equipment/device interconnections with the cable plant.
   4) Standard or typical details of installations unique to Owner’s requirements.
   5) Graphic symbols and component identification on detail drawing shall conform to the latest conventions.

      i) ANSI/TIA-568.0-D "Generic Telecommunications Cabling for Customer Premises"
      ii) ANSI/TIA-569-D "Telecommunications Pathways and Spaces"
      iii) ANSI/TIA-606-C "Administration Standard for Commercial Telecommunications Infrastructure"
      iv) ANSI/TIA-607-C "Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications"

2. The Communications Contractor shall deliver the Installer's Extended Product Warranty and Manufacturer's signed System Assurance Warranty of installed cabling system to include all components that comprise the complete cabling system.
   a. Delivery shall be completed within two (2) weeks of the time of final punch list review.
   b. Product Certificates shall be signed by manufacturers of cables, connectors, and terminal equipment certifying that products furnished comply with requirements.
3. Cable Testing Report Requirements
   a. Submit certified test reports of Contractor-performed tests. Contractor shall submit the required Test Reports in the format and media specified, upon completion of testing the installed system.
   b. The tests shall clearly demonstrate that the media and its components fully comply with the requirements specified herein.
   c. Three (3) sets of electronic and hardcopy versions of test reports shall be submitted together and clearly identified with cable designations.
   d. Cable inventory data shall be submitted for all fiber, copper, and coaxial cabling and termination components. Include products furnished:
      1) Manufacturer's name
      2) Manufacturer's part numbers
      3) Cable designations
      4) Location and riser assignments
      5) Product Data
4. Supply Owner with training manuals with instructions on methods of adding or removing cabling to/from firestopped sleeves and chases.

E. The Contractor’s BICSI Registered Communications Distribution Designer (RCDD) supervisor shall review, approve and stamp all documents prior to submitting. The Contractor’s RCDD shall warrant in writing that 100% of the installation meets the requirements specified herein upon completion of all work.

PART 2 - PRODUCTS

2.1 SUMMARY

A. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of telecommunications cabling products and shall be the manufacturer's latest standard design in satisfactory use for at least one year prior to bid opening.

B. All material and equipment, as provided, should be the standard Commercial-Off-The-Shelf (COTS) products of a manufacturer engaged in the manufacturing of such products.
   1. All shall be typical commercial designs that comply with the requirements specified.
   2. All material and equipment shall be readily available through manufacturers and/or distributors.

C. All equipment shall be standard catalogued items of the manufacturer and shall be supplied complete with any optional items required for proper installation.

D. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance and backward compatibility.

E. All materials shall be UL- and/or ETL-approved and labeled in accordance with NEC for all products where labeling service normally applies.

F. Materials and equipment requiring UL 94, 149 or 1863 listing shall be so labeled. Modification of products that nullifies UL labels is not permitted.

G. Backward Compatibility: The provided products shall be backward compatible with lower category ratings such that if higher category components are used with lower category components, the basic link and channel measures shall meet or exceed the lower category's specified parameters.

H. Component Compliance: The provided products shall each meet the minimum transmission specifications listed herein such that no individual component will be less than specifications for permanent link and channel, regardless of the fact that tests for link and channel ultimately meet required specifications.

2.2 ACCEPTABLE MANUFACTURERS

A. Identification (Labeling) System
   1. Brady
   2. Dymo
   3. Hellerman-Tyton
   4. Acceptable alternate

B. Fire-Stop Systems
   1. Hilti
   2. SpecSeal
   3. 3M
   4. Acceptable alternate

C. Other Products as Referenced in other Division 27 Specifications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Field Measurements

1. Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

B. Established Dimensions
1. Where field measurements cannot be made without delaying the work, coordinate with the General Contractor to establish dimensions.
2. When approved in writing, proceed with fabricating units without field measurements.
3. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

C. Pre-installation inspection
1. The Contractor shall visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport.
2. Visibly damaged goods are not acceptable and shall be replaced by the contractor at no additional cost to the Owner.

3.2 INSTALLATION

A. General
1. Contractor shall install work in accordance with specifications, drawings, manufacturer’s instructions and approved submittal data.

B. Allowable cable bend radius and pull tension:
a. In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation.
b. Refer to cable manufacturer's bend radius recommendations for the maximum allowable limits.
c. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. Use only lubricants specifically designed for cable installation.

C. Pull Strings
1. Provide pull strings in all new conduits, including all conduits with cable installed (trailer strings) as part of this contract.
2. Data and video cables can be pulled in tandem with pull strings.
3. The pull strings must move freely to prevent cable jacket/cable damage during pulls.

D. Labeling
1. Cable labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.
2. Flat-surface labels: Self-adhesive vinyl or vinyl-cloth labels, machine printed with alphanumeric cable designations.
3. Provide transparent plastic label holders, and 4-pair marked colored labels.
4. In accordance with ANSI/TIA-606-C "Administration Standard for Commercial Telecommunications Infrastructure":
a. Install colored labels according to the type of field as per color code designations.
b. Use “designation strip color-code guidelines for voice, data, cross-connect, riser, and backbone fields”.
5. Pathway Labels and Labeling System
a. Labeling system shall consist of a hand-held portable printer
b. Conduits: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive. Label size shall be appropriate for the conduit size. Font size shall be legible from the finished floor.
c. Inner duct: Polyethylene general-purpose tagging material attached using tie wraps.

d. Junction boxes: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name. Font size shall be easily visible from the finished floor.
e. All labels shall be permanent, i.e. will not fade, peel, or deteriorate due to environment or time.
f. Identification
   1) All conduits, junction boxes, gutters, and pull boxes shall have machine-generated labels easily visible from the finished floor.
   2) Conduits shall be labeled with the word “communications” and the conduit’s origination room number and destination room number.
   3) The Contractor shall label conduit at each wall and floor penetration and at each conduit termination, such as outlet boxes, pull boxes, and junction boxes, or as otherwise specified in other sections.
   4) Junction boxes, gutters and pull boxes shall be labeled with identification name or number as determined by contractor and submitted for approval.
   5) The Contractor shall label conduit sleeves at each wall and floor penetration.

E. Firestop
1. Provide approved fire-resistant materials to restore originally-designed fire-ratings to all wall, floor, and ceiling penetrations used in the distribution and installation for communications cabling system.
2. Install and seal penetrations (conduit, sleeves, slots, chases) in fire-rated barriers created for communications infrastructure to prevent the passage of smoke, fire, toxic gas, or water through the penetrations.
3. The firestopping material shall maintain/establish the fire-rated integrity of the wall/barrier that has been penetrated.
4. All through penetrations in a fire rated surface require a sleeve, regardless of penetration diameter or penetrating cable count.
5. Using a “ring and string” method of installing cabling for membrane penetrations in a wall cavity is acceptable, provided the solution was accepted by the Owner in writing. Code-compliant firestopping rules still apply.
6. Coordinate firestopping procedures and materials with General Contractor.
7. Sharing the pathway of other trades/utilities through compliant and non-compliant penetrations does not remove the requirement to maintain code-compliant firestopping.
8. Provide and install removable, intumescent mechanical systems in floor chases for all openings greater than 0’-4”.
9. Provide and install removable, intumescent, firestop bricks for all openings greater than 0’-4” where there are penetrations through walls.
10. Bricks shall be listed for insertion in fire-rated openings and require restraining materials or apparatus as needed per manufacturers’ specifications.
11. Provide manufacturer recommended material for rated protection for any given barrier.
12. Laminate and permanently affix adjacent to chases the following information:
    a. Manufacturer of firestop system.
    b. Date of installation/repair.
    c. Part and model numbers of system and all components.
    d. Name and phone numbers of local distributor and manufacturer’s corporate headquarters.
13. Solutions and shop drawings/submittals for firestop materials and systems shall be presented to the General Contractor for written approval of materials/systems prior to purchase and installation.
14. Materials shall be installed per manufacturer instructions, be UL-listed for intended use, and meet NEC and locals codes for fire stopping measures.
15. The material chosen shall be distinctively colored to be clearly distinguishable from other materials, adhere to itself, and maintain the characteristics for which it is designed to allow

for the removal and/or addition of communication cables without the necessity of drilling holes in the material.

16. Develop training manuals with instructions on methods of adding or removing cabling to/from firestopped sleeves and chases.

F. Within the normal environment, the installed systems shall not generate nor be susceptible to any harmful electromagnetic emission, radiation, or induction that degrades, or obstructs any equipment.

G. Expansion Capability: Unless otherwise indicated, provide spare conductor pairs in cables, positions in patch panels, cross connects, and terminal strips, and space in cable pathways and backboard layouts to accommodate 20% future increase in structure cable system capacity.

H. In the event of a breach of the representations and warranties contained herein, the Contractor, at their own expense, shall take all measures necessary to make the cabling system work and comply with the applicable manufacturer written technical recommendations and standards.

I. System Tests

1. Upon completion of the installation of the communications infrastructure systems, including all pathways and grounding, the Contractor shall test the system.
   a. Cables and termination modules shall be affixed, mounted or installed to the designed/specified permanent location prior to testing.
   b. Any removal and reinstallation of any component in a circuit, including faceplates, shall require retesting of that circuit and any other disturbed or affected circuits.
   c. Approved instruments, apparatus, services, and qualified personnel shall be utilized.
   d. The Contractor must verify that the requirements of the specifications are fully met through testing with an approved tester (rated for testing parameters listed elsewhere), and documentation as specified below.
   e. This includes confirmation of requirements by demonstration, testing and inspection. Demonstration shall be provided at final walk-through in soft copy and printed test data.
2. Non-Compliant Cabling
   a. Testing that shows some or all pairs of a cable do not comply with specifications, without written approval by the Owner, shall be replaced at Contractor's expense (including respective connectors).
   b. With the Owner's written approval, the over-length cable(s) shall be excluded from requirements to pass standardized tests and shall be explicitly identified.
      1) Testing is still required for non-compliant cabling.
      2) The tests shall be for wire-mapping, opens, cable-pair shorts, and shorts-to-ground.
      3) The test results must be within acceptable tolerances and shall be submitted with the Owner's acceptance document.
3. Failed Tests
   a. If tests fail, Contractor shall correct as required to produce a legitimate passing test.
   b. Manipulation of tester parameters on a failing test in order to achieve a passing test is unacceptable.
   c. If the Contractor is found to have manipulated or falsified any failing test result to show a "PASS" for any reason (without written notice and prior approval of the Owner), the Contractor shall be required to employ a Third-Party Testing Agent selected by the Owner to retest the complete cable plant and shall be required to pay all costs associated with this retesting.
4. Third-Party Testing
   a. Third-Party testing of the completed cable infrastructure is an Owner option that can be implemented and completed after:
      1) All Contractor testing is complete and submitted.

2) Contractor certifies that cable plant meets or exceeds test result requirements as specified in these documents and ANSI/TIA test standards.

b. Third-Party Testing Procedure
   1) Cable testing shall be conducted by the Third Party under the same testing protocols as the Contractor as described in these documents and ANSI/TIA test standards.
   2) The Third-Party shall pick a randomized sample of 15% of total installed cable plant.
   3) All Third-Party tested cables that test as failed shall be retested by the Third Party to confirm failure.
   4) If Third-Party tests show a failure rate of 1.5% or greater of tests of all completed cabling, this shall force the retesting of the complete cable plant by the Third-Party.
   5) All confirmed failures shall be promptly corrected according to manufacturer guidelines to ensure manufacturer's warranty remains in effect and retested by Contractor and Third-Party under the same testing protocols and guidelines.
   6) Payment

      i) Payment of all Third-Party testing shall be by the Owner if the Third-Party testing confirms Contractor's complete and standards-compliant test results.
      ii) Payment of all Third-Party testing shall be by the Contractor if Third-Party tests show a failure rate of 1.5% or greater of the randomized sample.

5. Owner reserves the right to be present during any or all testing.

3.3 CLEANING

A. The Contractor will clean all surfaces prior to final acceptance by Owner.

3.4 COMPLETION INSPECTION AND PUNCH LIST

A. When the Contractor determines that the Scope of Work has been completed in accordance with the plans and specifications, Contractor shall schedule a Completion Inspection with the Owner.

B. A Punch List will be generated during the Completion Inspection containing deficiencies in need of corrective action.

C. Complete all punch list deficiencies within 10 working days. The work is not complete until all punch list deficiencies have been addressed.

3.5 ACCEPTANCE

A. Once all work has been completed, test documentation has been submitted, and Owner is satisfied that all work is in accordance with contract documents, the Owner shall notify Contractor in writing of formal acceptance of the system.

B. Contractor must warrant in writing that 100% of the installation meets the requirements specified herein (Standards Compliance & Test Requirements).

C. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation soft and hard copies as described herein.

END OF SECTION

SECTION 270526
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes grounding and bonding products, design requirements and installation for communications systems.

B. Related Sections
1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications
3. Section 270543 Underground Ducts & Raceways
4. Section 271100 Communications Equipment Room Fittings
5. Section 271300 Communications Backbone Cabling
6. Section 271500 Communications Horizontal Cabling
7. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications referenced in Section 270000 form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts
1. Refer to Section 270000.

D. Codes and Standards
1. Refer to Section 270000.

1.3 SYSTEM REQUIREMENTS

A. General
1. All conductor wire, busbars and conduit shall be UL listed.
2. The communications ground system shall be independent from all power grounding except for the connection to the building's electrical service main grounding electrode system.
3. Power grounding and/or bonding shall not be allowed to interfere or provide any back feed or be a conductor to the separate communications ground system source or to any communications bonded materials or equipment.

B. Primary Bonding Busbar (PBB) and Telecommunications Bonding Conductor (TBC)
1. The main ground source feed for the Primary Bonding Busbar (PBB) in the ER (MDF) shall be an independent feed from the building's electrical service main grounding electrode system, known as the Telecommunications Bonding Conductor (TBC).
2. The TBC shall be a stranded copper ground wire from the building ground system to the PBB in the ER (MDF) sized at a minimum #4/0 unless otherwise sized by the Electrical Engineer of Record.
3. The TBC connections shall be low emission exothermic welds at the connecting ends.

C. Telecommunication Bonding Backbone (TBB) and Secondary Bonding Busbar (SBB)
   1. The Telecommunication Bonding Backbone (TBB) originates at the PBB and shall be extended from the PBB within the ER (MDF) throughout the building along the same route as the telecommunications backbone pathways, to the Secondary Bonding Busbar(s) (SBBs) in each TR (IDF).
   2. The minimum TBB conductor size between busbars shall be a stranded copper ground wire one (1) AWG size smaller than the Telecommunications Bonding Conductor (TBC).

D. TEBC and RBC
   1. All cabinets and racks shall be connected by the Telecommunications Equipment Bonding Conductor (TEBC). The TEBC is a stranded copper #4 conductor from the PBB/SBB extending along each row of racks within the room. Bond each rack with a Rack Bonding Conductor (RBC). The RBC is a stranded copper #6 conductor connected to the vertical rack bonding terminal. All connections shall be irreversible crimp connections. Route conductor so as to minimize the quantity of sweeping bends.

1.4 SUBMITTALS

A. Refer to Section 270000.

1.5 QUALITY ASSURANCE

A. Refer to Section 270000.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 270000.

B. The Contractor shall ship on manufacturer's standard reel sizes of one continuous length. Where cut lengths are specified, mark reel quantity accordingly.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include:

B. Cable Manufacturers
   1. Houston Wire and Cable Company
   2. Okonite Company
   3. General Cable
   4. Pirelli Cable Corporation
   5. Triangle Wire and Cable
   6. Owner Approved Alternate

C. Electrical Service Entrance Bonding Conductor and Connector Manufacturers
   1. Copperweld
   2. Thomas & Betts
   3. Blackburn
   4. Owner Approved Alternate

D. Exothermic Connector Manufacturers

1. Erico Products (Cadweld)
2. Continental Industries (thermOweld)
3. Harger
4. Owner Approved Alternate

E. Crimp Connector Manufacturers
1. Thomas & Betts
2. FCI Burndy Electrical
3. O-Z/Gedney
4. Owner Approved Alternate

F. Telecommunication Grounding Busbars
1. Chatsworth
2. Panduit
3. Leviton
4. Owner Approved Alternate

G. Bonding Straps
1. Chatsworth
2. Harger
3. Brundy
4. Owner Approved Alternate

H. C-Type Compression Taps
1. Brundy
2. Harger
3. Owner Approved Alternate

I. Antioxidant Joint Compound
1. Chatsworth
2. Owner Approved Alternate

J. Labeling
1. Refer to Section 270000.

K. Firestopping
1. Refer to Section 270000.

2.2 MATERIALS

A. Communications Grounding Conductors: Copper American Wire Gauge (AWG) wire of the following sizes:
1. Telecommunications Bonding Conductor (TBC): #4/0 (unless otherwise sized by the Electrical Engineer of Record)
2. Telecommunication Bonding Backbone (TBB): #3/0 (unless otherwise sized by the Electrical Engineer of Record)
3. Backbone Bonding Conductor (BBC): equal AWG as the TBB (unless otherwise sized by the Electrical Engineer of Record)
4. Telecommunications Equipment Bonding Conductor (TEBC): #4
5. Rack Bonding Conductor (RBC): #6

B. Grounding Connectors
1. Connectors shall be a copper alloy material and two-hole, double-crimp compression lug type at the connecting ends.

C. Primary Bonding Busbar (PBB)
1. Use pre-drilled copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors.
2. Sized for the immediate requirements and allow for 25% growth.
3. The minimum dimensions shall be 0'-¼" thick X 0'-4" wide X 1'-8" long.
4. Contain (2) tiers of pre-drilled holes for use with standard sizes of two-hole copper compression lugs.
5. ASTM-B187-C11000 Copper bar suitable for use with two-hole compression-type copper lugs.

D. Equipment Cabinet and Rack Bonding Busbar (RBB)
1. Provide and install a vertical ground busbar in all racks and equipment cabinets to be used as an equipment grounding bus.
2. The busbar shall be equal-flange (channel) 1'-7" (19) rack width and shall include ground bar, splice plate and #12-24 mounting hardware.
3. The minimum dimensions shall be 0'-¾" in width by 0'-3/16" in thickness.
4. The busbar shall have pre-drilled holes and shall be suitable for use with two-hole compression-type copper lugs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to Section 270000.

3.2 PREPARATION

A. Refer to Section 270000.

B. Copper and copper alloy connections should be cleaned prior to connection.

3.3 INSTALLATION

A. Refer to Section 270000.

B. The Contractor shall install the work in accordance with the specifications, drawings, manufacturer's instructions and approved submittal data.

C. All work shall be supervised and reviewed by the Contractor's on-site RCDD.

D. Installation plans and Requests For Information (RFIs) shall be reviewed by the Contractor's RCDD.

E. General
1. Bonding and grounding procedures and components shall comply with ANSI/TIA-607-C "Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications".
2. Bonding should be accomplished such that the bonding system is integrated and compliant with NEC specifications.
3. Bonding conductors shall be routed with minimum bends or changes in direction and should be made directly to the points being bonded.
4. Bonding connections should be made by using compression copper lugs. However, for parts of the ground electrode system that are subject to corrosion, must carry high currents

reliably, or for locations that require minimum maintenance, connections are made with low emission exothermic welding (see NEC Article 250).

5. Make connections to dry surfaces only.
6. Remove paint, rust, oxides, scales, grease and dirt from surfaces before making connection.
7. Burnish clean a 0'-1" X 0'-1" area, drill, tap, apply an adequate amount of antioxidant joint compound mixed for the metal surface types affected, and bolt conductor and connector to burnished and compounded area. Ensure proper conductivity.
8. Route bonding conductor(s) the shortest distance between bonding contact points.
9. The ground-wire connecting ends shall have a minimum amount of insulation removed at the ground lug.
10. Do not connect ground wire in power cable assemblies to the telecommunications ground system.
11. All grounding and bonding conductors shall be copper and may be insulated. If bare-bonding conductors are used, isolate bonding conductors and prevent contact.
12. Antioxidant material shall be installed to separate dissimilar metals and prevent corrosion.
13. If multiple systems are involved (lightning protection systems, communications, radio and TV, CATV, etc.), those systems shall be bonded together to minimize potential differences between the systems, per NEC 250.94.

F. Telecommunication Bonding Conductors

1. Each telecommunications grounding and bonding conductor shall be labeled at each end detailing the function and room number of its opposite end. Labels shall be located on conductors as close as practicable to their point of termination in a readable position. Labels shall be nonmetallic and include the following text, "TELECOMMUNICATIONS GROUND - DO NOT REMOVE. IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER".
2. Furnish and install all required bonding material, hardware, and utilize tools manufactured for this purpose.
3. The connections of the TBC, TBB, BBC, TEBC, and RBC shall be made using low emission exothermic welding or hydraulically crimped with a double crimp connector. Two-hole grounding lugs are preferred for connection to the grounding bus bars.
   a. All low emission exothermic welding shall be by Division 26.
   b. Coordinate with the building services personnel in occupied spaces to prevent the smoke from the exothermic weld process from potentially setting off smoke/fire alarms.
4. Grounding and bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place grounding and bonding conductors in a ferrous metallic conduit that exceeds 1m (3ft) in length, the conductors shall be bonded to each end of the conduit using a grounding bushing or a No. 6AWG conductor, minimum.
5. The bonding conductors should be installed without splices.
   a. Where splices are necessary, the number of splices should be minimized, be accessible, and be located within the telecommunications spaces.
   b. Joined segments of a bonding conductor shall be connected using exothermic welding, irreversible compression-type connectors, or equivalent. All joints shall be adequately supported and protected from damage.

G. Equipment Cabinets and Racks

1. The busbar shall be installed at the base and back of each cabinet/rack for floor fed cabinets/racks.
2. The busbar shall be installed at the top and back of each cabinet/rack for top fed cabinets/racks.
3. Each cabinet and rack shall be provided with a minimum # 6 AWG ground wire.
4. Do not loop from cabinet/rack to cabinet/rack.
5. Each cabinet or rack bay against the wall shall be bottom/side ground fed from the wall.
   a. Wall ground feeds/raceways to racks shall not be exposed on the walls.

b. Exception: Some cabinet or rack bays will require the ground to be fed from the ceiling raceway.

6. All ground raceways within each cabinet/rack or cabinet base and adjacent-ganged cabinet base shall be an insulated metallic flex type raceway and shall not interfere with equipment mounting frames or equipment mounting brackets.

H. Cable Runway, Cable Raceway and Support System Grounding

1. The Contractor shall provide communications cable tray and cable runway systems with a communications dedicated ground from the SBB.
2. All cable tray needs to be electrically continuous per NEC 250.96.
   a. Metal raceways, wire-mesh cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal non-current-carrying parts that are to serve as an alternate grounding path, with or without the use of supplementary equipment grounding conductors, shall be effectively bonded where necessary to ensure electrical continuity and the capacity to conduct safely any fault current plausibly to be imposed on them.
   b. Any nonconductive paint, enamel, or similar coating shall be removed at the threads, contact points, and contact surfaces.
   c. Grounding or bonding conductors shall be connected by fittings designed for that purpose to ensure adequate bonding.
3. The Contractor shall provide and install a #6 AWG ground wire to bond one end of each cable tray/runway system to the SBB.
4. For electrically non-continuous conduits that contain only grounding conductor, the Contractor shall bond the conduit and conductor together at both ends to ground to the nearest TGB with grounding bushings or ground clamps.

I. Shielded Backbone Cabling

1. The Contractor shall terminate and bond the shield to the nearest SBB or PBB at both ends, following manufacturer's guidelines.

3.4 FIELD QUALITY CONTROL

A. Testing

1. Upon completion of the electrical system, including all grounding, the Electrical Contractor shall test the system for stray currents, ground shorts, etc.
2. Approved instruments, apparatus, services, and qualified personnel shall be utilized.
3. If stray currents, shorts, etc., are detected, eliminate or correct as required.

END OF SECTION 270526

SECTION 270543

UNDERGROUND DUCTS & RACEWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes underground communications duct banks, hand-holes and maintenance holes

B. Related Sections
1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications Systems
3. Section 270526 Grounding and Bonding for Communications Systems
4. Section 271100 Communications Equipment Room Fittings
5. Section 271300 Communications Backbone Cabling
6. Section 271500 Communications Horizontal Cabling
7. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. Refer to section 270000.

B. Conflicts
1. Refer to section 270000.

C. Codes and Standards (Most recent editions or as required in contract)
1. National Electrical Manufacturers Association (NEMA)
   a. RN1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Electrical metallic Tubing
   b. TC2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
   c. TC3 PVC Fittings for Use with Rigid PVC conduit and tubing
2. Underwriters Laboratories (UL)
   a. 651 Schedule 40 and 80 Rigid PVC conduit
   b. 651A Type EB and A Rigid PVC Conduit and HDPE Conduit
3. ANSI/TIA-569-D Commercial Building Standard for Telecommunications Pathways and Spaces
4. ANSI/TIA-758-C Customer-owned Outside Plant Telecommunications Standard.
5. BICSI Telecommunications Distribution Methods Manual (TDMM)
6. Standard for Riser Application for Optical Fiber Raceway
7. BICSI Customer Owned Outside Plant (CO-OSP) Design Manual
8. Local, county, state and federal regulations and codes in effect as of date of installation
9. Equipment of foreign manufacture must meet U.S. codes and standards.
   a. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.
10. ANSI/IEEE C2-2007, National Electrical Safety Code (NESC), 2007 Edition

D. Related Documents
1. Refer to section 270000.

1.3 SUBMITTALS

A. Refer to section 270000.

1.4 QUALITY ASSURANCE

A. Refer to section 270000, and ANSI/IEEE C2-2007.

B. Follow Annex B of National Electrical Code (NEC).

C. Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped.
   1. Store nonmetallic ducts with supports to prevent bending, warping, and deforming

B. The contractor shall endeavor to make the site ready for installation of manholes when delivered so that they can be placed off of the truck into final position.
   1. When this is not possible, store precast concrete and other factory-fabricate underground utility structures as Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

D. Clearly mark containers "For Communications Duct Banks Only".

E. Refer also to section 270000.

1.6 WARRANTY

A. Refer to section IEEEC2.

B. Refer also to section 270000.

1.7 MAINTENANCE

A. Refer to section IEEEC2.

B. Refer also to section 270000.

PART 2 - PRODUCTS

2.1 ACCEPTIBLE MANUFACTURERS

A. Ducts
   1. Use owner approved solution

B. Hand Holes

1. Hubbell
2. Christy Concrete Products
3. Cretex Concrete Products West, Inc.; Riverton Division
4. Oldcastle Precast Group
5. Oldcastle Precast Inc/; Utility Vault Division
6. Utility Concrete Products, LLC
7. Owner Approved equivalent

C. Maintenance (Man) Holes
1. Christy Concrete Products
2. Cretex Concrete Products West, Inc.; Riverton Division
3. Oldcastle Precast Group
4. Oldcastle Precast Inc/; Utility Vault Division
5. Utility Concrete Products, LLC
6. Owner Approved equivalent

D. Innderducts
1. MaxCell Fabric Pre-Lubricated Multi-Cell innerduct
2. Owner Approved equivalent
   a. NOTE* It is recommended that the primary installer of any MaxCell Fabric Innerduct contact the manufacturer at 888.387.3828 at least two weeks prior to installation. A MaxCell Rep will make arrangements to be onsite to aid in the installation of the innerduct at no cost to the installer or project.

2.2 MATERIALS

A. Continuous Tape for Underground Conduit
1. The Contractor shall use orange warning ribbon, PVC tape (detectable, i.e., containing metallic tracings), three inches wide, permanently imprinted with "CAUTION--BURIED COMMUNICATIONS LINE BELOW" in black letters, minimum 0’-1” high.

B. Labeling
1. Refer to section 270000.

C. Firestopping
1. Refer to section 270000.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Where necessary, Contractor shall provide all excavation, boring, trenching, backfill and restoration of grounds for all OSP pathways.
1. In addition, Contractor shall include all labor, materials, and equipment.

B. The owner of the property has the option to obtain a testing laboratory to ensure proper soil compaction.

C. All work shall comply with all city, county and State Codes, NEC, EIA/TIA, OSHA, and BICSI TDMM requirements, codes and standards.

D. The above referenced codes and standards are to be considered as a minimum requirement.
   1. If the plans or specifications call for material and/or methods of construction higher than the standard, the plans or specification shall govern.

E. All holes, trenches and/or any other excavation shall be covered, fenced, and/or taped off to make the area safe at all times.
   1. Conform to general Contractor requirements.

F. The Contractor will visit the job site prior to submitting a proposal to determine existing conditions.
   1. Contractor shall evaluate the site for materials, and any other information that may affect the work to be performed.

G. The Contractor shall locate and protect all existing conduits.
   1. Should damage occur notify the appropriate utility.
   2. Damage costs are the responsibility of the Contractor.

H. The Contractor shall CALL BEFORE YOU DIG, One Call Directory Telephone Numbers (Texas: 1-800-245-4545, 1-800-344-8377) to locate any existing conduits (Power, Gas, Telephone, and other utilities) prior to start of work.

I. Any proposed re-routing of all trenches/pole lines shall be reviewed and approved by the owner/consultant.

3.2 PREPARATION

A. Refer to Section 270000.

B. The Contractor shall verify materials are on-site in proper condition and of sufficient quantity.

C. The Contractor shall verify proper excavation depth (minimum 4’-0” below finished grade), width, route and support of work.
   1. Verify proper location of hand-holes and maintenance holes (minimum every 350’-0”).
   2. Communications facilities must be placed in separate hand-holes and maintenance holes from electrical facilities.

D. Trenches greater than or equal to 5’-0” deep shall:
   1. Be shored to prevent cave-in.
   2. Have 2’-0” clearance from the dirt pile.

E. Directional boring is a suitable option when trenching is impractical or impossible.
   1. Locating existing underground utilities is crucial when directional boring is planned because of the potential for the drilling unit to encounter high voltages.
   2. Although directional boring machines are manufactured with electrical strike sensing capabilities, which can warn the operator of any contact with a high voltage source, accidents may still occur.
   3. Operators of directional boring machines require special protection due to the potential for exposure to high voltage.
      a. Therefore, operators must always have a ground mat grid underfoot as insulation protection.
      b. In addition, operators must wear insulating boots and gloves, along with hard hats and safety glasses.

F. Minimum separation between electrical and communications underground cable (measured from conduit sidewall:
   1. Concrete: 0'-3"
   2. Masonry: 0'-4"
   3. Well-tamped earth: 1'-0"

G. Before encasement, the Contractor shall:
   1. Prove and verify all ducts are free of debris and properly installed in support and spacer system.
   2. Verify the system is properly fitted together and hold-down hardware is properly installed.
   3. Verify ducts are capped at both ends

3.3 INSTALLATION

A. Refer to section 270000.

B. Hand Holes
   1. Unless otherwise shown, Hand-holes shall be at least 4'-0" X 4'-0" and shall be constructed of 0'-2" thick cement covered with 0'-3/8" steel plate.
   2. The hand-hole or maintenance hole shall rest on a 0'-4" blanket of sand, and 0'-4" around the sidewalls shall be filled with sand.
   3. Each hand-hole or maintenance hole which contains a pedestal shall have four bollards installed 1'-6" (18") diagonally from each corner, with a cross member welded at 2'-6" (30") connecting the four corners.
      a. These barriers will be constructed of 0'-4" ridged conduit filled with concrete, driven 4'-0" in the ground and extending 3'-0" above the protective cover.
   4. All Hand-holes shall have a hasp and locking plate installed so they can be locked with padlock.

C. Concrete and Reinforcing Steel for Encasement
   1. Furnish products following Division 03, except strengths as follows:
      a. Compressive Strength: 2500 psi at 28 days, class A
      b. Flexural Strength: 500 psi at 28 days
      c. Dye concrete encasement "orange" to identify communications conduit

D. The Contractor shall install conduit in excavations following drawings.
   1. If directional boring is utilized, cable or flexible conduits can be attached to the unit and pulled back to the origination point (after the drilling unit reaches its destination).

E. The Contractor shall install watertight penetrations through foundation, hand-hole and maintenance-hole walls.
   1. Wherever a hand-hole is used to simply pass through, the conduit entrances and exits will be situated at opposite ends of the hand-hole instead of 90° angles.

F. The Contractor shall assemble duct banks with non-magnetic saddles, spacers and separators.
   1. Position separators for 0'-2" minimum concrete separation between outer surfaces of adjacent ducts, and:
      a. Make uniform required bends with a minimum 2'-0" radius for conduits less than 0'-3" diameter, and a minimum 4'-0" radius for conduits 0'-3" and larger.
      b. Maintain vertical or horizontal separations of 1'-0" of well-packed topsoil from any electrical service conduit run parallel to communications conduits.

G. Install concrete encasement fully surrounding reinforcing steel and ducts.

H. Unless otherwise noted on the drawings, reinforce with longitudinal #5 steel bars placed at each corner and along each face at maximum parallel spacing of 1'-0" on center, and #5 tie-bars transversely placed at 1'-0" on center maximum longitudinal.
   1. Maintain maximum clearance of 0'-2" from bars to edge of forms and ducts.

I. For duct banks that are being installed for future use, extend rebar well past end of concrete for future tie-in to future concrete pour to ensure that both sections are firmly tied together to prevent slippage between the two pours.

J. Add orange colorants at mixing site at the rate of 10 lbs per cubic yard for voice and data cable.

K. Place concrete with minimum 0'-2" cover surrounding ducts and reinforcement.

L. Maintain ducts in proper place during concrete placement.

M. For duct banks that are being installed for future use, all conduits shall be extended minimum of 1'-0" past the end of the concrete and capped.

N. Transition from nonmetallic to metallic conduit where duct banks enter structures or turn upward for continuation above grade:
   1. Where ducts enter structures such as hand-holes, maintenance holes, pull boxes, or buildings, terminate ducts in proper end bells, insulated L-bushings, Meyers hubs or couplings on steel conduits.
   2. Ducts shall be sealed to prevent water and debris from entering the building.

O. Extend below grade conduits to 0'-4" above the finished floor inside a building:
   1. Cover or temporarily seal open conduit ends to prevent water and other foreign matter from entering conduit.

P. Tag conduits entering pull boxes with stamped stainless steel tags following cable and conduit schedule.

Q. Backfill after concrete cures 24 hours.

R. The Contractor shall pull a 1'-0" long mandrel (0'-¼" smaller than duct diameter) through ducts.
   1. Pull a rag swab or sponge through to remove debris, until it shows clean.

S. Where fiber optic cables will be used and/or where indicated in the drawings, innerduct shall be provided.

T. The Contractor shall provide a metered pull tape in all underground conduits and innerduct:
   1. Pre-lubricated, woven polyester, low friction, and high abrasion resistant yarn.
   2. Minimum average tensile strength shall be 1130 lbs for 0'-1.5" and smaller conduits and innerduct.
   3. Minimum average tensile strength shall be 1800 lbs for conduits larger than 0'-1.5".

3.4 CLEANING

A. Refer to section 270000.

END OF SECTION 270543

SECTION 27 11 00
COMMUNICATIONS ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes basic communications and equipment room design requirements and fittings including:
   1. Equipment cabinets, racks, frames and enclosures
   2. Cable management and ladder racks
   3. Telecommunications service entrance pathways
   4. Rack mounted power protection and power strips

B. Related Sections
   1. Section 26 00 00 Electrical (including related sub-sections)
   2. Section 27 00 00 Communications
   3. Section 27 05 26 Grounding and Bonding for Communications Systems
   4. Section 270543 Underground Ducts & Raceways
   5. Section 271300 Communications Backbone Cabling
   6. Section 271500 Communications Horizontal Cabling
   7. Section 28 00 00 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts
   1. Refer to section 27 00 00.

D. Codes and Standards (Most recent editions or as required in contract)
   1. Refer to 27 00 00.

1.3 COMMUNICATIONS ROOMS

A. Communications rooms must be dedicated to designated equipment and services:
   1. Space shall not be used for storage of equipment not related to designated equipment and services.
   2. Hazardous or corrosive materials shall not be stored in the space.
   3. Piping, ductwork and distribution of power, not related to designated equipment and services shall not pass through or be located within the space.
      a. Foreign piping such as water pipes, steam pipes, soil pipes, sanitary drains, storm drains, A/C ducts, and other unrelated systems utilized for or containing liquids, or gases shall not be installed or pass through communication rooms.
      b. With the exception of fire sprinklers, all water pipes shall be routed around communications room.

B. Each communication room shall be equipped with fire detection, fire-extinguishing system and prevention devices. Connect detection devices to base building fire alarm system. A minimum of one (1) smoke detector shall be installed in each communications room.

C. Walls shall be covered with 0'-¾" X 4'-0" X 8'-0" AC-grade plywood backboard 1'-0" AFF (smooth side to interior of room mounted vertically), capable of supporting mounted hardware and equipment.
   1. Plywood shall be affixed to the studs in the walls with screws that penetrate the studs a minimum of 0'-1", are spaced not greater than 1'-6" (18") apart in each stud, and with screws 0'-0" from the top and bottom of plywood.
   2. Plywood shall be sealed against the wall and painted on all exposed sides with two coats of flat white non-reflective paint.
   3. If applicable fire-treatment verification stamps on plywood shall be left unpainted to be readable.

D. Communications room walls shall extend from floor slab to ceiling deck, with no drop ceilings installed.

E. Cable tray or ladder rack should be used to distribute cables between rooms through finished wall penetrations.

F. Cable ladder rack should be used to distribute cables within rooms, complete with cable bend limiters (drop outs).

G. To reduce static, floors should not have carpet, but be sealed concrete to prevent concrete dust from forming.

H. Communications rooms shall have only one lockable entrance door, a minimum of 3'-0" wide and 7'-0" high, that opens towards the outside of the room, and does not open into another room.
   1. Doors shall be provided with a lockset for the appropriate technology key with pinned hinges and anti-pry guards.
   2. Doors should have no windows or door seals.
   3. Communications rooms should have no exterior identifying markings.

I. Mechanical
   1. Install monitoring sensors with dedicated environmental controls operating 24 hours a day, 365 days a year in the communications rooms.
   2. Provide ventilation in the communications rooms to dissipate heat generated by active devices.
   3. Temperature and Humidity requirements:
      a. Maintain communication rooms at an average of 60°F to 70°F, with a relative non-condensing humidity of 30% to 50%.
      b. The temperature range should be maintained within ± 9°.

J. Plumbing
   1. If "wet" fire suppression is used, install wire cages on sprinkler heads to prevent accidental operation.
   2. Do not place sprinkler heads over equipment or cabling. In the event of a leak this will protect the equipment and cabling.
   3. Drainage troughs are also recommended for leakage protection.

K. Electrical

1. One manufacturer's product is recommended for each type of installation. The mixing of different manufacturer products for one item is not acceptable.
2. No electrical feeders/branch circuits shall be placed in or run through any communications room except as required to service those rooms.
3. The Contractor shall install a slot (a UL-approved fire-rated assembly) to accommodate cable runway entry from corridor and a fire-retardant system (bricks, boards, mechanical, etc). The formed slot shall have no burrs or sharp edges. This opening in the wall will be used to pass data and voice cabling from the corridor cable tray into the communications room.
4. The Contractor shall provide uniform illumination of at least 50 foot-candles (fc) 3'-0" AFF for communications rooms located a minimum of 8'-6" AFF.
    a. Light fixtures in communications rooms are to be positioned for maximum lighting. Do not install over cable tray, ladder rack, or 1'-7" (19") standing racks.
    b. Provide enough power receptacles to support equipment and service. Coordinate power requirements of active equipment with electrical designer.

L. Relay Racks
1. 1'-7" (19") X 7'-0" relay racks are to be used for mounting and termination of inter-building and intra-building fiber optic/ copper cables and components.
    a. The racks shall have adequate horizontal and vertical cable management for the 8P8C patch panels and switches.
    b. Racks with active electronics shall have rack mounted power strips.

1.4 SUBMITTALS

A. Refer to section 27 00 00.

1.5 QUALITY ASSURANCE

A. Refer to section 27 00 00.

B. Product Standards
1. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of telecommunications cabling products and shall be the manufacturer's latest standard design in satisfactory use for at least one year prior to bid opening.
2. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Refer to section 27 00 00.

B. Coordinate layout and installation of equipment with owner's communications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1.7 PROJECT/SITE CONDITIONS

A. Refer to section 27 00 00.

1.8 WARRANTY

A. Refer to section 27 00 00.

B. At the start of the project, contractor shall register the project with the manufacturer to help insure and facilitate manufacturer's warranty process.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Equipment Cabinet, Floor Mounted
   1. Chatsworth – TeraFrame Gen3
   2. Owner approved alternate

B. Vertical Cable Manager (Waterfall Trough Top-of-Rack Inter-bay routing)
   1. Panduit
   2. Owner approved alternate

C. Horizontal Runway and Support Components
   1. Chatsworth
   2. Panduit – CMUT19/CMLT19
   3. Owner approved alternate

D. Horizontal Rack-Mount Cable Management – 1RU/2RU
   1. Panduit – WMPSE/WMP1E
   2. Owner approved alternate

E. Labeling
   1. Refer to section 27 00 00.

F. Firestopping
   1. Refer to section 27 00 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to Section 27 00 00.

3.2 PREPARATION

A. Refer to section 27 00 00.

B. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.

C. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

D. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.3 INSTALLATION

A. Refer to section 27 00 00.

3.4 FIELD QUALITY CONTROL

A. Refer to section 27 00 00.

3.5 CLEANING

A. Refer to section 27 00 00.

3.6 ACCEPTANCE

A. Refer to section 27 00 00.

END OF SECTION 27 11 00

SECTION 271300

BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the backbone cabling portion of a structured cabling system including:
   1. Copper backbone cabling
   2. Fiber backbone cabling
   3. Splicing
   4. Termination and patch cables

B. Provide all backbone cabling, terminating hardware, adapters, and cross-connecting hardware necessary to interconnect all system equipment including equipment located in Communications rooms.

C. Related Sections
   1. Section 260000 Electrical (including related sub-sections)
   2. Section 270000 Communications
   3. Section 270526 Grounding and Bonding for Communications Systems
   4. Section 270543 Underground Ducts and Raceways for Communications Systems
   5. Section 271100 Communications Equipment Room Fittings
   6. Section 271500 Communications Horizontal Cabling
   7. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts
   1. Refer to section 270000.

D. Codes and Standards (Most recent editions or as required in contract)
   1. ANSI/TIA-568.0-D: Commercial Building Telecommunications Wiring Standard
   2. ANSI/TIA-569.1-D Commercial Building Standard for Telecommunications Pathways and Spaces
   3. ANSI/TIA-606-C: Administration Standard for Commercial Telecommunications Infrastructure
   4. ANSI/NECA/BICSI-607-C: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
   5. National Electrical Code (NEC), based upon year approval by local codes or AHJ
   6. BICSI Telecommunications Distribution Methods Manual (TDMM)
   7. Local, county, state and federal regulations and codes in effect as of date of purchase
   8. Equipment of foreign manufacture must meet U.S. codes and standards. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

1.3 SUBMITTALS

A. Refer to section 270000.

B. Cable Pulling Plan
   1. The contractor shall submit a cable pulling plan prior to installation.
   2. Submittal requirements:
      a. Indicate the installed backbone conduit layout in schematic format, including junction boxes and distances between junction boxes.
      b. Indicate contents of each conduit.
      c. Indicate the cable pulling calculations, conduit fill ratios and actual cable runs and tensions.
      d. Include detail and schedule showing the construction sequence of communications rooms.
      e. Installation of cabling shall not commence prior to approval of the pulling plan and calculations by the engineer.

C. Splice Plan
   1. The contractor shall submit shop drawings indicating the intended cable splice points, mounting method and equipment list prior to installation

D. Cable Testing Plan
   1. Refer to Section 270000.

E. Cable Testing Reports
   1. Refer to Section 270000.

1.4 QUALITY ASSURANCE

A. Refer to section 270000.

B. Cable splicing personnel shall have a minimum of five years splicing experience and shall have completed a minimum of five major splicing projects.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to section 270000.

B. Storage temperature range: -40°F to 149°F (-40°C to 65°C)

C. Fiber cables shall be shipped on reels in lengths as specified with a minimum overage of 10%:
   1. The cable shall be wound on the reel so that unwinding can be done without kinking the cable.
   2. Two meters of cable at both ends of the cable shall be accessible for testing.
      a. All fiber shall be tested on the reel for continuity and distance compliance before installation.
   3. Each reel shall have a permanent label attached showing length, cable identification number, cable size, cable type, attenuation, bandwidth, and date of manufacture.
      a. Labels shall be water resistant and the writing on the labels shall be indelible.

1.6 PROJECT/SITE CONDITIONS

A. Refer to section 270000.

1.7 WARRANTY

A. Refer to section 270000.

PART 2 - PRODUCTS

2.1 ACCEPTABLE FIBER CABLE MANUFACTURERS

A. OSP (Outside Plant) cable
   1. Corning
   2. Draka
   3. CommScope
   4. Berk-tek
   5. Belden
   6. Owner approved alternate

B. OSP (Outside Plant) armored cable
   1. Draka
   2. Corning
   3. Belden
   4. Berk-tek
   5. CommScope
   6. Owner approved alternate

C. Armored & Plenum rated cable
   1. CommScope
   2. Berk-tek
   3. Belden
   4. Corning
   5. Draka
   6. Owner approved alternate

2.2 ACCEPTABLE COMPONENT MANUFACTURERS

A. Fiber Connectors, (LC)
   1. Corning
   2. Panduit
   3. Owner approved alternate

B. Fiber Duplex Patch Cables (Type SM)
   1. Corning
   2. Panduit
   3. Owner approved alternate

C. Fiber adapter panels (6-port)
   1. Panduit
   2. Corning
   3. Owner approved alternate

D. Fiber Termination Shelf (Rack-Mounted)
   1. Berk-tek
   2. CommScope
   3. Leviton

4. Corning
5. Panduit
6. Owner approved alternate

E. Labeling
1. Refer to section 270000.

F. Firestopping
1. Refer to section 270000.

2.3 FIBER BACKBONE CABLING

A. Fiber General Requirements
1. Fiber shall be certified to meet all parts of TIA-455 and comply with TIA-492, ANSI/ICEA S-83-596 and ANSI/ICEA S-83-640 and the NEC.
2. Fibers shall have D-LUX coating or approved equivalent to ensure color retention, minimize micro bending losses and improve handling. The coating shall be mechanically strippable.
3. Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked OFNP (optical fiber non-conductive plenum) in accordance with the NEC.
   a. Plenum Fiber rated cable consisting of multiple fibers shall have a Plenum PVC outer jacket.
      1) Each group of fibers shall have a color-coded Low Smoke PVC buffer.
      2) The buffered fibers are organized in subunits of fibers, reinforced with aramid yarn for extra strength and surrounded with a color-coded low smoke tube.
   b. Within the premises, all fiber shall be placed in plenum rated innerduct the entire length of the cable for protection. Use manufacturer plenum rated couplings for all connections.
4. Riser cable shall meet UL 1666 and be marked OFNR (optical fiber nonconductive riser) in accordance with the NEC.
   a. Non-plenum, riser rated cable consisting of multiple fibers, shall have an orange, Polyvinyl Chloride (PVC) outer jacket.
5. OSP (Outside Plant) Fiber
   a. Stranded loose tube dielectric fiber cable shall be utilized for underground conduit, direct buried, or aerial applications.
   b. Underground cable, including cable installed in conduits or duct banks, shall contain an additional moisture barrier in the form of a flooding compound.
   c. All OSP fiber strength members shall be dielectric without any metallic elements.
6. Fiber conductors shall follow standard color code schemes. Fiber numbers and binders shall correspond to the following color codes:
   a. Fiber/Binder No. 1 – blue
   b. Fiber/Binder No. 2 – orange
   c. Fiber/Binder No. 3 – green
   d. Fiber/Binder No. 4 – brown
   e. Fiber/Binder No. 5 – slate
   f. Fiber/Binder No. 6 – white
   g. Fiber/Binder No. 7 – red
   h. Fiber/Binder No. 8 – black
   i. Fiber/Binder No. 9 – yellow
   j. Fiber/Binder No. 10 – violet
   k. Fiber/Binder No. 11 – rose
   l. Fiber/Binder No. 12 – aqua
7. Cable Minimum Bending Radius:
   a. During Installation: 20X cable diameter
   b. After Installation: 10X cable diameter
8. Operating temperature range: -76°F to 185°F (-60°C to 85°C)

B. Single Mode Fiber Requirements
   1. Fibers shall have dual wavelength capability, transmitting at 1310 and 1550 nm ranges.
   2. 8.3 µm core
   3. 125 µm ± 1 µm cladding diameter
   4. Cladding non-circularity: = 1%
   5. Core/cladding concentricity error: = .5 µm
   6. Colored fiber diameter: 254 µm ± 7 µm
   7. Maximum Attenuation: 1.0 dB/km at 1310 and 1550 nm (inside premises) and 0.5 dB/km at 1310 and 1550 nm (OSP)
   8. Minimum Bandwidth: 20 GHz
   9. The mechanical and environmental specifications for OSP fiber cable shall be in accordance with ANSI/ICEA S-87-640. OSP fiber cables shall be of a water-block construction and meet the requirements for compound flow and water penetration as established by ANSI/ICEA S-87-640. Outdoor cable shall have minimum pull strength of 2670 N (600 lbf).

2.4 FIBER PATCH CABLES

A. Verify exact quantities and lengths with Owner prior to purchase

B. Provide the appropriately-rated (matched to the installed cable plant) Modular Patch Cords for the appropriate location and equipment.

C. Single Mode patch cables shall be a stepped-index 8.3 µm core with a 125 µm cladding.

D. Duplex lC connectors shall meet the following specifications:
   1. Made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed patch cord specifications as outlined in TIA standards.
   2. Patch cords shall be in original packaging when presented to the Owner.

E. Aramid yarn and a jacket of flame-retardant PVC shall cover the fiber cladding.

F. Single Mode patch cable additional requirements:
   1. Return Loss: -50 dB maximum
   2. Mated Connector Loss: $\mu = 0.35$ dB, $\sigma = 0.2$ dB
   3. Connection Repeatability: 0.20 dB maximum changes per 200 re-connects.

G. The Single Mode connector (visible portion) and adapter/outlet shall be identified by the color blue.

2.5 LABELING

A. Refer to Section 270000.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to Section 270000.

B. Verify the following before proceeding:
   1. Conduits, cable trays and pull boxes are properly installed following section 270528
   2. Backboards in communications rooms are properly installed following section 271100

3. Grounding system is properly installed and tested following section 270526
4. Liquid-carrying pipes are not installed in or above voice and data system communications rooms.
    a. Do not proceed with installation in affected areas until removed.

3.2 PREPARATION

A. Refer to section 270000.

3.3 COPPER INSTALLATION

A. Backbone Cable
1. The Contractor shall install riser cables according to manufacturer's instructions for compliance to warranty requirements.

B. OSP Cable
1. The Contractor shall verify pulling material (pull rope, mule tape, etc.) average breaking strength based on cable type and size, pulling distance and pathway, and other pertinent factors.

3.4 FIBER INSTALLATION

A. Fiber Cable Installation
1. Fiber cable shall be installed in innerduct from near end termination point to far end termination point.
    a. Only UL-approved plenum-rated innerduct shall be installed in all plenum areas.
    b. Metallic conduit may be used in lieu of innerduct in plenum-rated ceilings if it is bonded and grounded correctly.
2. Only technicians certified by the product manufacturer shall perform terminations.
    a. Terminations shall be made in a controlled environment.
    b. Cables may be assembled off-site, although testing must be completed with the cable in its final installed condition.
    c. Test optical fiber on the reel for distance and continuity verification before installation.
3. At each location where fiber cable is exposed to human intrusion, it shall be marked with warning tags.
    a. These tags shall be yellow or orange in color, and shall contain the warning "CAUTION FIBER OPTIC CABLE".
    b. The text shall be permanent, black, block characters, and at least 0'-.1875" high.
    c. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not less than 5'-0".
    d. Any section of exposed cable that is less than 5'-0" in length shall have at least one warning tag affixed to it.

B. Fiber Distribution Center
1. Contractor shall provide sufficient spare adapter plates to fill the appropriate-sized FDC.

3.5 FIBER TERMINATION AND SPLICING

A. Interconnect Units and Distribution Shelves
1. Modular in design and used in fiber interconnection, cross-connection, and splicing applications
2. 1'-7" (19") rack-mountable
3. Accept 12-strand, 24-strand, 48-strand or 72-strand terminations

4. Owner approved industry standard connector

B. Splicing and closures
1. Fiber splice modules shall be utilized for all OSP terminations.
2. The link shall consist of:
   a. Fiber cable
   b. Splice
   c. Splice tray holder/closure
   d. Fiber panel/coupler
   e. Pre-manufactured fiber pigtail with pre-polished fiber connector
   f. Fiber jumper to connect the pigtail-coupled link to the appropriate electronic switch

C. Fiber Fusion Splice
1. Fusion splices shall be mounted in protective trays within the closure.
2. Fusion splices shall not exceed a maximum optical attenuation of 0.3 dB when measured in accordance with ANSI/TIA-455-34, Method a (factory testing) or ANSI/TIA-455-59 (field testing).
   a. Fiber splices shall have a minimum return loss of 26 dB for Single Mode
      1) Minimum Single Mode return loss for broadband analog video (CATV) applications is 55 dB.

3.6 INSTALLATION REQUIREMENTS

A. All installation shall be done in conformance with ANSI/TIA-568-D standards, BICSI methods, and industry standard installation guidelines.
1. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities.
2. Failure to follow the appropriate guidelines shall require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation.
3. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.

B. The Contractor shall provide service loops for cables terminating in the communications rooms.
1. A 10’-0” service loop shall be provided and secured in a neat and standards-compliant manner above the equipment racks or cable trays unless specified otherwise.
2. This allows for future changes or expansion without installing new cables.

C. Documentation
1. All cable inventory data documentation shall be submitted in format coordinated with and approved by owner so that data can be incorporated into existing databases.
2. Documentation shall include cable identification number, source and destination, type of cable, length of cable and number of pairs or fibers.
3. Complete cross connect documentation is required. It shall include detailed documentation of each pair of all copper backbone cable and strand of fiber.

3.7 FIELD QUALITY CONTROL

A. Refer to section 270000

3.8 FIBER POST-INSTALLATION TESTING

A. Provide all labor, materials, tools, field-test instruments and equipment required for the complete and proper test measurements of the installed fiber cabling.

B. Contractor shall have successfully attended a fiber testing training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof.

C. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing.
   1. Any testing performed on incomplete systems shall be redone on completion of the work.

D. Dust caps shall be placed on fiber endfaces or adapters for each optical fiber link after all testing is complete on the fiber link.

E. Pre-test Submittals
   1. Manufacturers catalog sheets and specifications for the fiber cable field-test instruments including
      a. OLTS (Optical Loss Test Set)
      b. OTDR (Optical Time Domain Reflectometer)
   2. A schedule (list) of all fiber cables to be tested
   3. Fiber testing training program certificate
   4. Sample test reports

F. Fiber testing standards
   1. The Contractor shall meet or exceed the following standards and guidelines:
      a. ANSI/TIA-568.3-D Optical Fiber Transmission/Test Requirements, and Annex E: Optical Fiber Field Test Guidelines (Tier 2)
         1) Tier 2 testing is a higher level of testing that provides qualitative measures of the installed condition and performance of the cabling system
      b. ANSI/TIA-568.3-D Optical Fiber Cabling Components Standard
      c. TIA/TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
   2. Multi-mode requirements
      a. ANSI/TIA-526-14-A, Method B
      b. ANSI/TIA-455-50B
   3. Single Mode requirements
      a. ANSI/TIA-526-7, Method A.1: Optical Power Loss Measurements of Installed Single Mode Fiber Cable Plant-OFSTP-7
   4. The cable installers shall have a copy of these references in their possession and be familiar with the contents

G. In order to conform to the overall project event schedule, the contractor shall survey and coordinate the optical fiber testing with other applicable trades.

H. In addition to the test regiment detailed in this document, the contractor shall notify the Owner of any additional tests that are deemed necessary to guarantee a fully functional system.
   1. The contractor shall carry out and record any additional measurement results at no additional charge.

I. The contractor shall provide all test measurement results two (2) weeks prior to substantial completion in spreadsheet format and native file format from the test instrument.
   1. Software shall also be provided to view the native results.

J. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
   1. A visible fault locator (VFL) normally uses a Class 2 or 3 light source and should not be directly viewed.

2. Safe usage of the tool requires indirect viewing of the light source by pointing the end of the fiber at an adjacent surface (or introducing another surface in front of a fixed mounted connector) until the presence of light is determined.

K. Link attenuation measurement and allowance calculation
1. The measured link attenuation shall be less than the link attenuation allowance. The link attenuation allowance is calculated as:
   a. Link Attenuation Allowance (dB) = Cable Attenuation Allowance (dB) + Connector Insertion Loss Allowance (dB) + Splice Insertion Loss Allowance (dB)
      1) Connector Insertion Loss Allowance (dB) = Number of Connector Pairs X 0.4dB
      2) Splice Insertion Loss Allowance (dB) = Number of Splices X 0.15dB
      3) Cable Attenuation Allowance (dB) = Maximum Cable Attenuation Coefficient (dB/km) X Length (km)

L. Fiber Testing Requirements
1. All installed fiber links shall be field-tested and pass the following tests:
   a. OLTS (Optical Loss Test Set) length and dual wavelength attenuation
   b. OTDR (Optical Time Domain Reflectometer) traces and event tables
2. OLTS (Optical Loss Test Set)
   a. The length and attenuation of each installed fiber link shall be measured and documented.
   b. System loss measurements requirements:
      1) 1310 and 1550 nanometers for Single Mode
   c. Reflective events (connections) shall not exceed 0.75 dB.
   d. Non-reflective events (splices) shall not exceed 0.3 dB.
   e. The acceptable link attenuation for Multi-mode horizontal fiber is based on the maximum distance of 295’-0”.
   f. A horizontal link in a network with a consolidation point may be tested using a fixed upper limit for attenuation of 2.75 dB.
   g. Optical sources shall be turned on for a minimum of 5 minutes prior to referencing.
   h. Fiber links shall be measured and reported for attenuation in each direction and attenuation bi-directionally (averaged in both directions)
   i. Polarity shall be verified for duplex connector systems
   j. Mandrels
      1) Where mandrels are used, secure the mandrel to the light source by some means such as a cable tie or tape.
      2) Care should be taken to ensure that the fiber jacket is not deformed or damaged when using a cable tie or tape.
      3) The light source shall be referenced to the meter a minimum of twice daily (i.e., in the morning and noon).
3. OTDR (Optical Time Domain Reflectometer)
   a. An OTDR trace shall be taken of each fiber link in one direction to ensure uniformity of cable attenuation and connector insertion loss
   b. Testing shall consist of a bi-directional end to end OTDR trace performed per TIA 455-61
   c. Individual connector, splice and fiber insertion loss shall be evaluated using the OTDR trace.
   d. Fibers shall be inspected at 250X for Multi-mode and 400X for Single Mode
4. Maximum Attenuation
   a. Single Mode ISP (inside) 1.0 dB/km at 1310 nm and 1550 nm
   b. Single Mode OSP (outside) 0.5 dB/km at 1310 nm and 1550 nm
5. Test Cords (Jumpers)
   a. Testing of the cabling shall be performed using high-quality test cords of the same fiber type and core size as the cabling under test. Use a single patch cord reference for fiber testing.

1) OLTS test cords shall be between 3'-3" (1m) and 16'-4" (5m).
2) OTDR testing shall be approximately 328'-0" (100m) for the launch cable and at least 82'-0" (25m) for the receive cable. OTDR testing shall be Bidirectional with Pigtails installed.

b. The test jumper, the adapters, and fiber under test shall be cleaned immediately prior to each fiber being tested.
1) After cleaning, cleaning solutions shall be given sufficient time to evaporate (approximately 30 seconds) prior to the mating of fiber test jumper to the fiber under test.

6. Test Failure
a. Any fiber link that fails these requirements shall be diagnosed and corrected.
b. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link meets performance requirements.

7. Acceptable Testers
a. Fluke DTX, DSX Cable Analyzer
b. SIECOR
c. Owner Approved equivalent

M. The Owner or the Owner's representative shall be invited to witness, review or both witness and review field-testing.
1. The Owner or the Owner's representative shall be notified of the testing start date, five (5) business days before testing commences.
2. The Owner or the Owner's representative will select a random sample of 5% of the installed links and test that sample.
a. The measured results obtained from the random sample shall be compared to the data provided by the contractor.
b. If more than 2% of the sample results differ in terms of the pass/fail determination, the contractor under supervision of the Owner or Owner's representative shall repeat 100% of the testing at no cost to the Owner.

N. Test Results
1. The detailed test results documentation data is to be provided in an electronic database for each tested fiber strand and shall contain the following information:
a. Identification of the customer site as specified by the end-user.
b. Name of the test limit selected to execute the stored test results.
c. Name of the personnel performing the test.
d. Date and time the test results were saved.
e. The manufacturer, model and serial number of the test instrument.
f. The version of the test software and the version of the test limit database held within the test instrument.
g. Fiber identification number
h. Length for each optical fiber
i. Index of refraction used for length calculation when using a length capable OLTS.
j. Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
k. Test results to include OTDR link and channel traces and event tables at the appropriate wavelength(s).
l. Length for each optical fiber as calculated by the OTDR.
m. Overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements.
n. Circuit IDs reported by the test instrument should match the specified label ID.

3.9 CLEANING

A. Refer to section 270000.

3.10 ACCEPTANCE

A. Refer to Section 271500.

END OF SECTION 271300

SECTION 271500
HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This section of the horizontal cabling portion of a structured cabling system includes:
   1. UTP Copper cabling

B. Provide all horizontal cabling, terminating hardware, adapters, and cross-connecting hardware necessary to interconnect all system equipment including equipment located in communications rooms.

C. Related Sections
   1. Section 260000 Electrical (including related sub-sections)
   2. Section 270000 Communications
   3. Section 270526 Grounding and Bonding for Communications Systems
   4. Section 270543 Underground Ducts & Raceways
   5. Section 271100 Communications Equipment Room Fittings
   6. Section 271300 Communications Backbone Cabling
   7. Section 28 00 00 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts
   1. Refer to section 27 00 00.

D. Codes and Standards
   1. Refer to section 27 00 00.

1.3 SUBMITTALS

A. Refer to sections 27 00 00.

1.4 QUALITY ASSURANCE

A. Refer to section 27 00 00.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to sections 27 00 00.

B. Storage temperature range: -40°F to 149°F (-40°C to 65°C)

1.6 PROJECT/SITE CONDITIONS

A. Refer to section 27 00 00.

1.7 WARRANTY

A. Refer to section 27 00 00.

1.8 MAINTENANCE AND SUPPORT

A. Refer to section 27 00 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Labeling
   1. Refer to section 27 00 00.

B. Firestopping
   1. Refer to section 27 00 00.

2.2 ACCEPTABLE COPPER MANUFACTURERS

A. UTP Plenum Rated Cable
   1. General Cable – 7131800 - Blue
   2. Owner approved alternate

B. Data/Voice Outlet Components
   1. Panduit – NK688MBL
   2. Owner approved alternate

C. Patch Panels (Flat 1 RU 24 or Flat 2 RU48 port)
   1. Panduit – NK6PP24P/NK6PP48P
   2. Owner approved alternate

D. Copper Patch Cords
   1. Panduit – UTP28SP10BU
   2. Owner approved alternate

E. Wall and/or Rack Mount 110 Termination Blocks
   1. Panduit
   2. Owner approved alternate

2.3 ACCESSORIES

A. Mount one laminated full-size hard copy in color of an as-built floor plan designating workstation locations, pathways, and communications room locations. Confirm hard copy size with Owner.

B. Provide clear plastic lamination serving each communication room.

C. Install the laminated drawings within a protective Plexiglas encasement on the wall of the servicing communications rooms. To ease accessibility, the Plexiglas encasement shall be in either flip-down format or file folder format.

2.4 HORIZONTAL COPPER CABLING

A. Recognized cabling for providing the signal medium from the work area to the communications room shall include the following:
   1. Category 6 UTP cable

B. Category 6 UTP Cable Requirements
   1. 23 AWG solid bare copper.
   2. Cable jacket shall comply with NEC Article 800 for use as a plenum cable and shall be UL and c (UL) Listed Type CMP (communications multipurpose plenum).
   3. Cable shall terminate on an eight-pin modular jack at each outlet. All horizontal cabling shall meet or exceed the ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
   4. Cables shall be marked as UL verified with a minimum of Category 6 rating
   5. The cable shall support Voice, Analog Base band Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS-422, RS-485, 10BASE-T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 155 Mbps ATM, AES/EBU Digital Audio, 270 Mbps Digital Video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, gigabit ATM, as well as all 77 channels (550 Mhz) of analog broadband video
   6. The maximum horizontal cable length for Category 6 copper cable from the termination of the cable in the communications room to the outlet is 295’-0”.
   7. Cable shall meet or exceed the following electrical characteristics:
   8. Cable shall be specified to 250 MHz and shall meet the manufacturer’s guaranteed electrical performance and physical specifications.

2.5 TERMINATION HARDWARE

A. Patch panels
   1. Patch panels shall be rated to match installed cable plant
   2. The wiring block shall accommodate #23 AWG cable conductors.
   3. All modular cross connect panels shall be UL-listed.

B. Work Area Outlet
   1. Universal eight-position jack pin/pair assignments
   2. Jack Color:
      a. Data/Voice: Black

C. Work Area Outlet Faceplates:
   1. White or ivory to match electrical outlets.

2.6 PATCH CABLES

A. Verify exact quantities and lengths with Owner prior to purchase

B. Patch Cable requirements:
   1. Category 6, stranded UTP cable
   2. Standard modular non-keyed, 8-position 8-conductor plug
   3. 94V-0 rated
   4. UL listed
   5. Meets FCC Part 68

C. Provide 3’-0”, 5’-0”, 7’-0”, and 10’-0” Patch Cords at the communications room for each installed port.

1. Coordinate with Owner on the active equipment layout prior to purchase to ensure correct sizing of patch cords from patch panels to switching equipment.
2. When connecting voice ports to a copper riser, provide a one-pair stranded 8P8C connector on one end and 110GS on the other end and shall be of appropriate length for application.

D. Provide a 10’-0” Station Cord for each work area outlet port.

E. All cords shall conform to the requirements of ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard.

F. Cords shall be equipped with an eight-pin modular connector on each end, wired straight through and shall be of appropriate length for application.

G. All rated patch cords shall be round, and consist of #28 AWG copper, stranded conductors, tightly twisted into individual pairs.

H. Patch cords shall be made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed patch cord specifications as outlined in TIA standards.

2.7 IDENTIFICATION (LABELING) SYSTEM

A. Refer to sections 27 00 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to Section 27 00 00.

3.2 PREPARATION

A. Refer to section 27 00 00.

B. The Contractor shall check pathways, raceways, and other elements for compliance with space allocations, installation tolerances, debris, hazards to cable installation, and other conditions affecting installation prior to installation.

3.3 INSTALLATION REQUIREMENTS

A. Refer to section 27 00 00.

B. All installation shall be done in conformance with ANSI/TIA-568-C standards, BICSI methods, industry standards and manufacturer's installation guidelines.
1. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities.
2. Failure to follow the appropriate guidelines shall require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation.
3. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.

C. Install cable using techniques, practices, and methods that are consistent with specified data cabling and the installed components and that ensure specified performance levels of completed and linked signal paths, end to end.
   1. Pull cables in smooth and regular motions using methods that prevent cable kinking.
   2. Pull cables simultaneously if more than one is being installed in the same raceway/pathway.
   3. If necessary, use approved cable pulling lubricant
   4. Use fish tape, cable, rope, basket weave wire/cable grips, and other tools that will ensure no damage to the media or raceway.
   5. Install open cabling parallel and perpendicular to surfaces or structural members following surface contours where possible.
   6. Do not bend cable greater than a bend radius of 0'-1".

D. Provide a 10'-0" service loop at the communications room and shall provide a 1'-0" service loop in the wall behind the work area outlet faceplate. In the event of insufficient spacing, contractors are to place the work area outlet service loop above the access ceiling or cable trays unless specified otherwise.
   1. All service loops shall be a minimum of 1'-0" (12") in diameter and be accessible for maintenance.

E. Coordinate loop placement and orientation with the technology consultant.
   1. This allows for future changes or expansion without installing new cables.

F. Install cables in continuous "home run" lengths from work station outlet to specified patch panel.
   1. No intermediate punch down blocks or splices may be installed or utilized between the communications rooms and the workstation outlet without written Owner permission.

G. All cable must be handled with care during installation so as not to change performance specifications.
   1. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable.
   2. There shall never be more than 0'-½" of unsheathed cable at either the wiring closet or the workstation termination locations.

H. All cabling and associated hardware shall be placed so as to make efficient use of available space.
   1. All cabling and associated hardware shall be placed so as not to impair equipment's efficient use of their full capacity.

3.4 CABLING METHODS

A. The Contractor shall provide cabling in accessible spaces, cable tray, (surface and/or enclosed raceway), conduits, and/or J-Hook cable support system.
   1. Within consoles, racks, cabinets, desks, and counters, in accessible ceilings spaces and in gypsum board partitions where open cable method may be used.
   2. Use UL or ETL listed plenum rated cable in all spaces.
   3. Provide all necessary installation materials, hardware, tools and equipment to perform insulation displacement type terminations at all data outlets, patch panels, and voice termination materials.

B. Conceal raceway and cabling except in unfinished spaces as is practical.

C. Exposed Cable
   1. All station cabling shall be installed inside walls or ceiling spaces whenever possible.

2. Exposed station cable will only be run where indicated on the drawings and will only be allowed when no other options exist.
   a. Owner must approve all exceptions.

D. The Contractor shall utilize conduits/cable tray as indicated on the drawings.

E. All cabling placed above drop ceilings must be supported by cable tray, J-hooks, caddy bags or conduit.
1. The Contractor shall permanently affix cable supports to the building structure or substrates and provide attachment hardware and anchors designed for the structure to which attached and are suitably sized to sustain the weight of the cables to be supported.
   a. Attaching cable to pipes or other mechanical items is not permitted.
   b. Cabling shall not be attached to ceiling grid wires.
2. Multiple cables are to be dressed every 5’-0” to 7’-0”.
   a. Maximum cable sag between cable hooks is 3”-6”.

F. The Contractor shall route data and voice cables separately in a neat and orderly fashion.
1. No cable ties or wraps shall be used to secure the cables in the runway outside of the communications rooms. Cable ties shall be rated for the environment.

G. Keep all items protected before and after installation with dust and moisture proof barrier materials/envelopes.

H. If wiring is terminated on patch panels, data, voice jacks prior to painting, carpet installation, and general finish clean up, these jacks shall be placed in a protective envelope to ensure dust, debris, moisture, and other foreign material do not settle onto jacks’ contacts.
1. Envelope will be removed on final trim out after other trades have completed their finish work.
2. It shall be the Contractor’s responsibility to ensure the integrity of these protective measures throughout the life/installation of the project.
   a. Cable bundles brought into the communications rooms shall be routed and dressed in such a manner that prior to termination the cables are not subject to damage and misuse such as installers walking on the bundles that are on the floor.
   b. Cable pulling force shall not exceed 25 lbs of pulling tension or cable manufacturer’s recommended pulling tensions.
   c. Do not leave cables on the floor unprotected or cable bundles hanging from the ceilings. Coil them up in a temporary manner and protect them from damage.

I. Communications room cables shall be combed and dressed in a manner as to prevent twists, “braiding” and crossed cables in the cable bundle from the communication room entrance to the termination point at the rear of the patch panel.
1. Behind the patch panel, the cable bundle shall be attached to the rear cable support bar, and shall drop out each cable in a neat, cascading manner to prevent crossed and/or interwoven cables to each patch panel port termination point.
   a. Use Velcro wraps instead of cables ties for all bundling in the communications rooms.
   b. Plastic/nylon tie-wraps are not allowed to permanently secure cables inside the communications room.

3.5 CABLING SEPARATION

A. Comply with TIA rules for separating unshielded copper communication and data-processing equipment cables from potential EMI sources, including electrical power lines and equipment.

B. Maintain a minimum spacing of 1’-6” (18”) from electrical feeders and/or branch circuit wiring including, but not limited to, light fixtures, sources of heat and EMI sources.

C. Maintain a minimum spacing of 1’-0” from auxiliary systems cabling.

D. Maintain a 1’-0” separation where cables must pass perpendicularly to electrical, plumbing, or other wiring, conduit, or piping systems.
   1. Use non-conduit bushings, if necessary to maintain separation, which allow for the addition of a reasonable number of cables in the future.

E. Maintain communications pathways away from electrical apparatus such as motor driven equipment and transformers, minimum separation distance of 10’-0” is recommended.

3.6 CABLING TERMINATION

A. Terminate cables in consistent consecutive order.

B. Terminate cables onto 8P8C modular patch panels without damaging twisted pairs or jacket.

C. Arrange cables on patch panels and voice termination hardware in ascending order of room numbers and outlet numbers within rooms.

D. Provide a 10’-0” service loop for horizontal cables at each rack in communications rooms.
   1. Locate loop at ceiling deck or on bottom of cable runway in minimum 1’-6” (18”) diameter.

E. Provide a 1’-0” service loop for horizontal cables at work area outlets. Locate service loop in the wall behind the work area outlet faceplate. In the event of insufficient spacing, contractors are to place the work area outlet service loop above the access ceiling or cable trays unless specified otherwise.

F. Maintain twists in cable pairs to within 0’-½” of termination.

G. Video Surveillance Systems Cabling (Electronic Safety and Security <ESS> devices)
   1. Video Cameras will require a field terminated plug on the end of a horizontal cable to be directly plugged into device.
      a. Follow TIA-862-A Building Automation Standard.
      b. Contractor shall use applicable equipment in testing solid conductor plug.
   2. Group all security systems cables in one group.
   3. Clearly label cable number and function, in the last positions on the horizontal cabling blocks in each communications room.

H. Building Systems Cabling (BAS, FA, elevator line, etc)
   1. Coordinate exact placement and connectivity requirements with applicable trade prior to installation.
   2. Group all building systems cables in one group.
   3. Clearly label cable number and function, in the last positions on the horizontal cabling blocks in each communications room.

I. Limit cable-bending radius to 20X the cable diameter during installation, and 15X the cable diameter after installation.

J. Start numbering at the left of the main door to the room and continue in a clockwise direction around the room.

1. The cables within the room will be terminated starting with the cables located to the left of the main door to the room and continue around the room in a clockwise direction.

3.7 TERMINATION HARDWARE

A. Station Hardware
   1. Flush mount jacks shall be mounted in a faceplate with back box.
   2. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches without prior Owner approval.
   3. 8P8C Jack Pin Assignments for work area outlets shall match the T-568B wiring scheme.

B. Patch panels
   1. Copper cables shall be terminated in eight position/eight conductor (8P8C) modular patch panels.
   2. All Modular jack panels shall match the T-568B wiring scheme.

C. Work Area Outlet
   1. 8P8C non-keyed modular outlets for applications up to one Gbps and ANSI/TIA-568-C compliant for the specified transmission requirements

D. Work Area Outlet Faceplates:
   1. Furnish and install blank plates in all unused ports.

3.8 SPECIAL CIRCUITS

A. The Contractor shall coordinate with the Owner on the cable termination plan for special circuits, including cables to wireless access point locations, security, elevators, fire alarms, etc.

B. Wireless Access Points
   1. Install two (2) cable from dedicated wireless patch panel(s) in communications room to outlets having 8P8C connectors within a secure metal enclosure.
   2. Enclosures shall be NEMA rated for the environment to which they are exposed.

3.9 IDENTIFICATION AND LABELING

A. Labeling system shall consist of a hand-held portable printer and labels appropriate to the application. Handwritten labels are not acceptable.

B. Fiber termination hardware (designation strip) shall have a 0'-¾" x 0'-¼" thermal transfer printable label with a permanent acrylic adhesive

C. 110-type copper termination hardware shall have a laser printable, non-adhesive label designed for 110 terminal block marking.

D. All labels shall be permanent and shall not fade, peel, or deteriorate due to environment or time.

E. The Contractor shall provide a copy of the finalized plan in writing to the Owner representative and DataCom Design Group for review and authorization to proceed.
   1. Coordinate with Owner for specifications on labeling of all hardware, cabling, and related equipment prior to any testing.

F. Labeling requirements:
   1. Label cable terminations on designation strips
   2. Label all cable at each terminating point.

3. Label each port of the work area outlet.
4. Cable identification numbers shall not be duplicated.
5. Label patch panels and wall mounted termination blocks in the communications rooms to match those on the corresponding voice and data outlets.
   a. The font shall be at least 0'-1/8" in height.
6. Where a wireless access point is installed above an acoustical ceiling, label the ceiling grid frame below the access point, displaying the data port number and, if applicable, the access point identification number. Coordinate labeling of grid with Owner and Architect prior to application of labels.
7. Label each distribution rack, block and other terminating equipment unit and field within that unit within 0'-4" from the block or patch panel termination. Keep labels in a neat and orderly lineup.
8. Label each connector and each discrete unit of cable-terminating and connecting hardware within connector fields, in wiring closets and equipment rooms.
   a. Where similar jacks and plugs are used for both communication and data-processing equipment, use a different color for jacks and plugs of each service.
9. Post the cable schedule in a prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations.

G. Location and termination field description
   1. Room location
   2. Rack-mount or Wall mount
   3. Termination field type
      a. Specific patch panel ports versus a separate dedicated patch panel
      b. 110-type or M66 blocks

H. Unique identifiers
   1. Segregation and position on equipment rack
   2. Port color-coding
   3. Unique labeling

I. Documentation
   1. Provide electronic copy of final comprehensive schedules for project in software and format selected by Owner.
      a. All labels shall correspond to as-built drawings and to final test reports.
   2. All cable inventory data documentation shall be submitted in format coordinated with and approved by Owner so that data can be incorporated into existing databases.
   3. Documentation shall include cable identification number, source and destination, type of cable, length of cable and number of pairs or fibers.
   4. Complete cross connect documentation is required.

3.10 FIELD QUALITY CONTROL

A. Refer to section 27 00 00.

3.11 POST-INSTALLATION TESTING

A. Contractor shall test each pair or strand of every cable prior to acceptance. (100% PASS)

B. Contractor shall submit acceptance documentation as defined below. No cabling installation is considered complete until test results have been completed, submitted and approved.

C. Standards Compliance and Test Requirements:
   1. Cabling shall meet ANSI/TIA-568-C.2 Category 6 Horizontal cabling requirements.

D. Attenuation, NEXT, PSNEXT, Return Loss, ELFEXT, and PSELFEXT data that indicate the worst case result, the frequency at which it occurs, the limit at that point, and the margin.
   1. These tests shall be performed in a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements.
   2. Information shall be provided for all pairs or pair combinations and in both directions when required by the appropriate standards.
   3. Length, propagation delay, and delay skew relative to the relevant limit.
      a. Length, propagation delay, and delay skew shall be tested relative to the relevant limit.
      b. Test shall also include mutual capacitance and characteristic impedance.
      c. Any individual test that fails the relevant performance specification shall be marked as a ‘FAIL”.

E. Cable Test Documentation:
   1. Cable test documentation shall be submitted in hard copy and electronic formats.
      a. If proprietary software is used, disk or CD shall contain any necessary software application required to view test results.
      b. Electronic reports shall be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report.
      c. Certificate shall reference traceable circuit numbers that match the electronic record.
   2. Each test record shall contain the cable ID as follows:
      a. “MEDIA TYPE – SOURCE ROOM – DESTINATION ROOM – STRAND/PAIR #”, e.g. MM-MC-HC23-001.
   3. Test results saved within the field-test instrument shall be transferred into an accessible database utility that allows for the maintenance, inspection and archiving of the test records.
      a. These test records shall be uploaded to the PC unaltered, i.e., “as saved in the field-test instrument”.
      b. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.
   4. Test reports shall include the following information for each cabling element:
      a. Wire map results that indicate that 100% of the cabling has been tested for shorts, opens, miss-wires, splits, polarity reversals, transpositions, presence of AC voltage and end-to-end connectivity.
      b. Length, propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
      c. Cable manufacturer, cable model number/type, and NVP
      d. Tester make & model, serial number, hardware version, and software version.
      e. Cable ID and project name
      f. Auto-test specification used
      g. Overall pass/fail indication
      h. Date of test

F. Cable Test Equipment
   1. Contractor shall supply all of the required test equipment used to conduct acceptance tests.
   2. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers shall be ISO 9001 certified.
   3. Testing equipment shall be UL-verified to meet Level III accuracy.

a. The cable installers shall have a copy of this reference in their possession and be familiar with the contents.

4. Testing equipment shall be within the calibration period recommended by the manufacturer.
5. Testing equipment shall have the latest software and firmware installed.
6. Testing equipment of a given type shall be from the same manufacturer, and have compatible electronic results output.
7. Test adapter cables shall be approved by the manufacturer of the test equipment.
   a. Adapter cables from other sources are not acceptable.
   b. Adapter cables must be replaced after 1000 tests to ensure accuracy.
8. Test equipment must have a dynamic range of at least 100 dB to minimize measurement uncertainty.
9. Test equipment must be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.
10. Test equipment must include S-Band time domain diagnostics for NEXT and return loss (TDNXT and TDRL) for accurate and efficient troubleshooting.
11. Test equipment must be capable of running individual NEXT, return loss, etc measurements in addition to auto tests. Individual tests increase productivity when diagnosing faults.
12. Test equipment must include a library of cable types, sorted by major manufacturer.
13. Test equipment must be able to internally group auto tests and cables in project folders for good records management.
    a. Test equipment must store at least 1000 auto tests in internal memory.
14. Test equipment must include DSP technology for support of advanced measurements.
15. Test equipment must make swept frequency measurements in compliance with TIA standards.
16. The measurement reference plane of the test equipment shall start immediately at the output of the test equipment interface connector.
17. There shall not be a time domain dead zone of any distance that excludes any part of the link from the measurement.
18. Acceptable testers:
    a. Fluke DTX CableAnalyzer
    b. Owner approved equivalent

3.12 CLEANING

A. Refer to section 27 00 00.

3.13 ACCEPTANCE

A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.

B. Contractor's RCDD shall warrant in writing that 100% of the installation meets the requirements specified herein.

C. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and submittal and approval of full documentation as described above. Tests with the "* PASS" (asterisk) will not be acceptable.
   1. These circuits must be repaired to meet "PASS".

END OF SECTION 27 15 00

SECTION 280000

ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 PROJECT SUMMARY/OVERVIEW

A. This document covers the general requirements for work to be performed to provide electronic security and surveillance.

B. The contents of this document, along with related drawings and other documentary material, are critical to the security of this project and Owner and shall remain secure and confidential.

1. Confidential information shall not be deliberately or inadvertently disclosed to anyone other than the Contractor's personnel and subcontractors who require disclosure to perform their portion of the work.
2. This confidential information shall be tracked to ensure that copies are accounted for and properly destroyed when no longer needed to perform the work.

C. The security systems shall consist of the following integrated subsystems as specified herein:

1. Electronic Access Control and Intrusion Detection
2. Emergency Intercommunications and Duress
3. Wire and Cable

D. Provide complete turnkey systems with the exception of those items noted within this specification as being provided by others.

E. Related Sections include:

1. Section 087100 Door Hardware
2. Section 260000 Electrical (including related sub-sections)
3. Section 270000 Communications (including related sub-sections)
4. Section 281000 Electronic Access Control and Intrusion Detection
5. Section 282600 Emergency Intercommunications and Duress
6. Section 283100 Fire Alarm and Smoke Detection

1.2 GENERAL REQUIREMENTS

A. Upon completion of commissioning testing and Owner acceptance, DataCom Design Group bears no liability or responsibility for the continued proper operation of the installed systems.

B. The Items described herein shall not be modified or substituted without consent of DataCom Design Group and/or the Owner.

C. Electronic security systems integrator (security subcontractor) manager/supervisor shall attend meetings arranged by the Contractor, Architect, Owner or other parties affected by the work of this Section 280000.

D. If the manufacturer of security devices or connecting hardware has supplied post manufacture performance data, copies of such are to be kept for inclusion in the documentation and made available to the Owner upon request.

E. All materials are to be new unused and of the latest series of model number, unless otherwise indicated by the Owner or security system designer.

F. All security integrator personnel must be manufacturer certified and capable of an installation that falls under the manufacturer's guidelines necessary to obtain a manufacturer warranty.

1. The integrator shall provide all components/materials essential for a complete and functional security access and surveillance system.

G. Security integrator shall issue a two (2) year warranty on installation and workmanship.

H. These Specifications and Drawings are intended for bidding purposes only, No part shall be copied or used for any purpose other than bidding on this project.

1. This package shall be contractual upon bid award.

I. Drawings and Specifications are to be used in conjunction with one another and to supplement one another.

1. In general Specifications determine the nature and quality of the materials and tests, and drawings establish the quantities, details and give characteristics of performance that should be adhered to in the installation of the security system components.
2. If there is an apparent conflict between the drawings and specifications, or within the specifications themselves, the items with greater quantity or quality shall be estimated and installed.
3. Clarification with the Owner/Designer about these items shall be made prior to purchase and installation.
4. Questions regarding the Specification or system requirements should be directed in writing to DataCom Design Group or the Owner.

J. Security integrator shall adhere to Division 1 general requirements and written security Specifications and Drawings within this construction package and shall be responsible for complying with all local, state and federal laws or regulations applicable to the work being performed, even though said law, rule or regulation is not identified herein.

K. Security integrator shall arrange and pay for any inspections required by the public agencies having jurisdiction in the area.

L. The security contractor shall procure and maintain for the duration of this agreement, insurance against claims for injuries to persons or damages to property which may arise from, or conjunction with, the performance of the work hereunder by the security integrator, his agents, representatives, or employees.

1. The security integrator shall pay the cost of such insurance.

M. The security integrator will respect and protect the privacy and confidentiality of the Owner, his employees, processes, products, and intellectual property to the extent necessary, consistent with the legal responsibilities of the State of Texas and the Owner.

N. If required the security integrator shall sign a non-disclosure agreement and abide by its requirements to keep confidential all information concerning bid documents and this Project.

O. Furnish submittals and manuals in accordance with Division 1.

P. Furnish a detailed material list complete with suppliers (distributors) list of components and distributors name, address, and phone number.

Q. Refer to Specifications issued by Architect, Division 1, for Project and cost payments.

1.3 REFERENCES

A. The publications listed below form a part of this Specification. The publications are referred to in the text by basic designation only.

B. Specific reference in Specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. For conflicts between referenced requirements and contract documents comply with the one that is more stringent.

1. Federal, State, and Local codes, regulations and ordinances
2. NFPA 101: Life Safety Code
3. NFPA 72: National Fire Alarm Code
4. NFPA 730: Guide for Premises Security
5. NFPA 731: Standard for the Installation of Electronic Premises Security
6. National Electric Code (NEC), latest edition
7. Building Codes (UBC) (IBC), latest editions
8. Occupational Health and Safety Act (OSHA)
9. Americans with Disabilities Act (ADA)
10. Local Governing Authorities Having Jurisdiction
11. Underwriters Laboratory (UL) Applicable Standards for Safety and Security
12. Institute of Electrical and Electronics Engineers (IEEE) Applicable Standards
13. Telecommunications Industry Association (TIA) Applicable Standards
14. Williamson County Police Department standards for Security Systems

D. Related Documents

1. Security Drawings
2. General provisions of contract
3. Uniform general conditions
4. Supplementary general conditions
5. Architectural plans & specifications
6. Requirements of Division 1
7. Electrical / Mechanical / Telecommunications specifications and plans.

1.4 DESCRIPTION OF SYSTEM WORK

A. Furnish and install all materials, tools, equipment, and services for all electronic security/surveillance devices to provide functioning systems in accordance with performance

requirements specified and any modifications resulting from reviewed shop and field coordinated drawings.

1. Access Control System

   a) This system replaces the typical mechanical key controlled door lock with a door locking system that uses an access card as the access credential.
   b) The system includes an electric door-locking mechanisms, card reader located adjacent the door, door status sensor, door prop alarm and a request to exit device.
   c) Typical system configuration is card or schedule controlled entry with free exiting.

2. Intrusion Detection System

   a) This system monitors areas for unauthorized entrance or intruder.
   b) This system can consist of motion sensors, door status sensors, glass break sensors and one or more control keypads.
   c) The keypad is used to arm/disarm system by entering a numeric code on the keypad.

3. Video Surveillance System

   a) This system is used to provide video surveillance through the use of cameras of security sensitive areas and target items.
   b) The system shall allow for the viewing and recording of images.

4. Emergency Intercommunications and Duress Systems

   a) Duress Buttons

      1) These buttons, also known as panic buttons, are installed in locations where potential personal safety or security threats exist.
      2) Depressing the button sends a silent priority alarm signal to assigned monitor with location and specific alarm information
      3) The panic button is usually located in the knee space underneath a desk or service counter.

   b) Emergency Phone / Intercom / Call Stations

      1) The device typically is a distinct box or pole with a call button.
      2) Depressing the call button puts the individual in direct voice contact with assigned monitor along with specific location information.

B. RACKS AND ENCLOSURES

1. Wall mounted enclosures, data gathering panels, and power supply panels shall be installed as per manufacturer’s requirements.

   a) Coordinate pathways and power with Electrical and Telecommunications Contractors
   b) Furnish all labor, materials, tools, equipment, and services for all control consoles, equipment racks, cabinets, and enclosures not provided by others in accordance with contract documents.
   c) Completely coordinate with work of other trades to avoid duplication in purchasing.

d) Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.

2. The installation of the relay racks/cabinets for Electronic Surveillance shall be by the Telecommunications Contractor.

a) Coordinate locations with G.C.

C. Provide all supplementary or miscellaneous items and devices incidental to or necessary for a sound and complete installation.

D. Drawings are representative and show general arrangement of systems and equipment, except when dimensioned or detailed.

1. For exact locations refer to dimensioned architectural drawings.

a) Field measurements take precedence over dimensioned drawings.
b) Field verify locations and arrangement of all systems and equipment.
c) Coordinate all work with other trades and Contractor.

E. Circuit Supervision

1. Supervise all signal and data transmission lines, links with other systems, and sensors.

a) Indicate circuit and detection device faults with both protected zone and trouble signals.
b) Initiate an alarm in response to opening, closing, or shorting of a signal or data transmission line.

F. Electronics systems work as specified in this Section and Sections 281000, 282300, 282600 shall include:

1. A project kick-off/pre-submittal meeting with the Architect, Designer, and Contractor to review security design package.

a) Additional participants shall include:

1) Division 8 subcontractors
2) Division 26 subcontractors

2. Preparation of pre-installation submittals, including point-to-point wiring information for security equipment to interface to work by others prior to start of any installation work. Include lock permit requests in submittals for review.
3. Furnishing and installation of all security devices, components and accessories.
4. The furnishing and coordination on installation of special back boxes for security equipment and field devices as required.
5. Furnishing, installation and termination of all copper wiring and cabling including any special purpose wire and cable for electronic security systems.

a) Coordinate all network and fiber optic cable interface provided by telecommunications subcontractor.

6. Coordinate raceway and power distribution systems provided by Division 26.

7. Provide and install 12/24 VAC/DC input power to all field devices as required.
8. Coordination with other trades and Owner required to facilitate the installation of the security equipment including:

    a) Division 08 (doors)
    b) Division 26 (power, raceways, and fire alarms)
    c) Division 27 (telecommunications network interface).

9. Wiring and termination of electrified door hardware by security subcontractor shall be concurrent with the installation of these electrified components by the door hardware subcontractor.
10. Programming of all security control equipment and prior coordination with the Owner's security and telecommunications personnel.
11. Preparation of "As-Built" documentation.
12. Warranty service for completed work.

1.5 SUBMITTALS

A. Refer to Requirements of Division 1.

B. Pre-Installation Submittal Requirements

1. Submittals for electronic security shall be complete and submitted at the same time.

    a) No partial submittals will be accepted for review.
    b) Allow 2 weeks for consultant review of submittals.

2. General Requirements

    a) A functional description of each system.
    b) All cable and wiring types for each device type used.
    c) Certification that lock wiring and access control systems requirements have been coordinated with electrified door hardware, fire alarm systems, automatic door controls, and overhead door controls specified in other sections and other packages.
    d) Power supply points listing with devices and maximum loads to prevent overloading.
    e) Battery backup calculations to show load and back-up times for UPS and power supplies with batteries.
    f) Equipment schedules listing all system components, manufacturer, model number and quantities of each.
    g) Qualifications and proof of work history (with references).

3. Product Data Cut-sheets

    a) Complete manufacturer's technical data including manufacturer warranty information, descriptive literature, illustrations, and installation instructions for all components included within this project indicating compliance with applicable referenced standards, size, dimensions, model number, electrical characteristics, support requirements, connection requirements and all applicable information verifying that submitted components comply with Contract Documents.

4. Shop Drawings

a) Floor plans necessary to identify specific device locations, cable routes and quantities, cable types, riser locations, and references to installation details and diagrams.
b) Riser diagram showing routes between floors or other areas that are not easily identified on the floor plans.
c) Security One-line diagrams showing all input and output points of the system.

1) The Contractor shall make any corrections required by the consultant team, file with him two corrected copies and furnish such other copies as may be needed.
2) The consultant's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless he has in writing called the Architect's attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules.

d) Release of CAD Files

1) Contractor may request to utilize DataCom's AutoCAD floor plan files for assistance in producing shop drawings.
2) Request shall be made by signing DataCom's "Agreement for Release of CAD Files" letter.

5. Warranty

a) The Contractor shall provide the appropriate documentation to comply with the requirements described in the WARRANTY section.

6. Qualifications

a) The Contractor shall provide the appropriate documentation to comply with the requirements described in the QUALITY ASSURANCE section.

C. As-Built drawings shall be in current AutoCAD format, same version as used by the Architect.

1. Dimensions and scale of the drawing sheets submitted shall match the size of the drawing used for the contract documents, and shall include the following.

a) Utilize normally recognized drafting procedures that match AutoCAD standards, Architect, and Designer guidelines and methodology.
b) The As-Built drawings shall incorporate all changes made to the building identified in, but not limited to, Addenda, contemplated change notices, Site Instructions or deviations resulting from site conditions.
c) Dimensioned plan and elevation views of all security components.
d) Cable routing paths of security cables to identified infrastructure pathways.
e) All rack, cabinet, and enclosure locations and labeling thereof.
f) One-line diagrams of equipment/device interconnecting cabling of the security systems.
g) Standard or typical installation details of installations unique to Owner's requirements.
h) Submit one soft and one hard copy with project deliverables within 30 days of project completion.

D. Security integrator shall provide three (3) paper copies and one (1) electronic copy (PDF format) of a properly indexed O&M Manual at the conclusion of the project, which will include, but not be limited to the following requirements:

1. Ring binder with project title, properly indexed, and contractor's name on cover and spine including:

   a) Sequence of operations, design philosophy, and specific functions
   b) System block diagram
   c) Equipment list including:

      1) A brief description
      2) Model
      3) Total number of each item used in the project.

   d) Manufacturers' data sheet and O&M manual for associated equipment.
   e) Maintenance requirements for equipment, inspections and preventative maintenance schedules.
   f) As-built drawings for each floor plan layout and rack and wall elevation layouts. Each drawing shall show:

      1) Cable type and identifier
      2) Actual cable routing pathway
      3) Device number (camera, etc.),
      4) Device input/output number.

   g) Final test data (measured video levels, day & night camera snapshots in JPEG format and other significant operating parameters).
   h) List of system associated mechanical locking keys with key codes and tamper resistant hardware types.

1.6 QUALITY ASSURANCE

A. Electronic security systems integrator (security subcontractor) shall meet the following minimum requirements.

1. Maintain a valid Type B license from the Texas Private Security Bureau.
2. Have successfully completed three (3) projects of similar size and complexity that have been in proper operation for a period of one (1) year.
3. Technicians shall be factory trained and certified in specified systems.
4. The Project manager and supervising/lead technician shall have been regularly engaged in the installation and testing of the products specified for not less than five (5) years and maintain manufacturer certification.
5. The security integrator must maintain an operating facility in the local area (50 mile radius) of the Project location to provide service to the Owner for the warranty period.

   a) At the Owners request for service, the security integrator shall dispatch a service technician to the location to affect the required repairs or adjustments.

6. The contractor shall maintain a spare parts inventory necessary to resolve component failures of the system.

a) Refer to individual specification section for a list of specifically required parts provided to the owner and stored on site. These parts will become the property of the owner.

1) At the end of the warranty period the security integrator shall test the owner's spare parts and repair or replace as needed to bring the parts up to proper operation.

B. Security integrators desiring approval must comply with Division 1 requirements.

C. Security integrator must be cognizant of site conditions, verify locations of new and existing equipment, and determine exact requirements for connection and interface.

1.7 DELIVERY, STORAGE AND HANDLING

A. Equipment and components shall be delivered properly protected and undamaged with original containers, packaging, and labels intact.

B. Store, handle, and protect all related materials and equipment in accordance with Manufacturer's recommendations.

C. Provide additional protection during handling as necessary to prevent breaking, scraping, marring, or otherwise damaging products or surrounding areas.

D. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants.

1. Equipment damaged prior to system acceptance shall be replaced at no cost to the owner.

E. Protect all equipment and components that are to be installed from theft, vandalism, or use by unauthorized persons.

1.8 PROJECT/SITE CONDITIONS

A. Security integrator is responsible for conducting a site survey prior to the commencement of work to determine locations of all existing security devices and verify the proposed locations of the new components to be installed.

B. Security integrator will coordinate all work through the Contractor and schedule work to cause as little interference or interruption of existing services as possible.

C. Security integrator will arrange and pay for all necessary permits, licenses, and inspections.

1. Security integrator shall prepare all information necessary to obtain a permit for Electronic Locking Mechanisms in compliance with the Owner requirements.

D. Verify with Division 26 installer all conduits and special back box requirements in a timely manner.

1.9 WARRANTY

A. See requirements in Division 1 Specifications.

B. The Security Integrator shall warrant all completed work, including all materials and labor, to be free from defects in design, workmanship, and/or materials for a period of two (2) years from final acceptance date.

1. System acceptance is defined as the completion of all functional performance testing and the resolution of all punch list items.

C. Warranty Service

1. In the event that defects in the materials and/or workmanship are identified during the warranty period, the contractor shall provide all labor and materials to correct the deficiency.
2. All service work shall be performed by factory certified technicians.
3. All warranty service shall include the replacement of all parts and or components as required to restore normal system operation.

a) If parts or components need to be repaired, a loaner will be supplied and installed until the part or component can be repaired and reinstalled.

4. Immediately following a warranty service request, the Contractor shall provide written documentation to Owner which details the service work completed, cause of trouble, and any outstanding work required to restore a complete and normal system.

D. Warranty service requests shall be responded to within 4 hours of notification with a qualified service technician on site.

E. All repairs shall be completed within 48 hours upon site arrival.

1. If the failure exceeds 48 hours, the Owner reserves the right to require the contractor provide on-site manufacturer support at no additional cost to Owner.

F. Extended warranties on equipment components offered by the manufacturer shall be passed through to the Owner.

1. Warranty provisions shall be fully transferable only at the direction of the Owner, in the event that ownership of the installed security systems is transferred.

1.10 SYSTEMS STARTUP AND TRAINING

A. After all systems have been tested, accepted and turned on for operation, the Security integrator shall provide "User Training" to Owner personnel.

1. The onsite training shall cover all newly installed electronic security components, devices and systems. The training classes shall total a minimum of twelve (12) hours for up to four (4) people of the Owner’s choosing.
2. Two (2) separate training sessions will be conducted, one for system operators and one for system administrators.
3. The contents of the manuals will include:

a) Title page with subject, system name, owner’s name, and an owner approved confidentiality notice.

b) Table of contents.
c) Manual that details system and sub-system operation.
d) Manuals that details system administration procedures and tasks.
e) Manuals that fully detail all programming commands.

4. Provide two (2) Bound hardcopy System Administration training manuals and one electronic copy (PDF format).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer's are shown in individual specification sections.

B. Equipment manufacturers and model numbers indicated in individual specification sections are identified as minimum equipment requirements.

C. All substitutions shall meet or exceed these minimum requirements and must be approved by the Owner/Architect prior to purchase.

D. All manufacturers' equipment shall be available through a nationally recognized supplier network.

2.2 EQUIPMENT

A. Provide security fasteners on all equipment, device plates, etc. within public areas.

1. Allen head with center pin, hardened steel.
2. Provide four (4) fastener tools to Owner.

B. Equipment installed in exterior applications shall be fitted with fasteners and exposed surfaces of stainless steel or other corrosion resistant material.

C. All materials and equipment used must be new and unused, prime quality products.

D. All equipment or components installed on the exterior of a building where the equipment is subject to adverse weather/elements shall be enclosed in weatherproof enclosures.

2.3 WIRE AND CABLE

A. All wire and cable shall be U.L. approved for its intended application and shall meet or exceed manufacturer's recommendations for the components connected.

B. All conductors and cable shall meet individual security system manufacturer specifications.

1. Provide shielded conductors and cable as required by the manufacturer or as required to provide for interference-free signals.
2. Color coding shall be accomplished by using solidly colored insulation.

a) Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by NEC.

C. Increase conductor sizes on cables as required to be consistent with circuit current ratings, length of wire runs, and manufacturers' recommendations.

1. Alarm device field wiring shall be in accordance with the equipment manufacturer's specifications.
2. Low voltage power circuits shall use conductors as required by the equipment manufacturer's specifications.
3. Plenum rated cable shall be used as required by code.

D. UTP Structured Cabling Systems for IP cameras and intercoms (including pulling, terminating, and testing) by Division 27 Telecommunications contractor.

1. Intra-building data communications circuits shall utilize UTP cable as specified in Telecommunications specifications.

E. Patch Cables

1. Provide pre-manufactured patch cables (cable, connectors, boots, etc.) as required to connect security systems to voice and data communication outlets.
2. Patch cables shall be certified for their specific use to meet or exceed applicable industry specifications.
3. Provide cable lengths as necessary to neatly route cables through cable management systems and other cable organization systems.
4. Provide connectors as required for proper termination.

a) Provide boots for connectors where applicable to prevent snagging.

F. The minimum conductor sizes are for distances as per the manufacturer's specifications from security device to security panel.

1. The contractor shall size the conductor accordingly for longer runs.
2. Minimum Conductor and Cable Types and Sizes.

a) Alarm device field wiring shall be 18/20 AWG stranded copper conductors.
b) Low voltage power circuits will use 18 AWG stranded copper conductors.

1) Increase conductor gauge consistent with circuit current requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All personnel working on this project shall be experienced, highly skilled installers with a minimum of three (3) years work on similar type projects.

B. Changes in location of any work require the written approval of the Architect/Owner prior to initiation.

C. Changes in indicated sizes shall not be made without the written approval of the Owner/Architect.

D. Install all equipment in accordance with manufacturer's recommendations.

E. All systems shall be designed and installed to provide 24 hour a day, 7 days a week operation.

F. Primary pathways

1. All security cabling run from rack/enclosure head-end equipment to security devices shall follow primary telecom routing pathways.
2. Security wire non-UTP cabling shall be kept separated from the data cabling
3. Security wire non-UTP cabling shall be routed in bridle rings secured to the outside of the telecom tray where applicable.

    a) Arlington loops or J hooks shall be used where telecom pathways are not present

4. Provide all necessary anchoring devices and supports.

    a) Use structural supports suitable for equipment, or as indicated.
    b) Check loading and dimensions of equipment with shop drawings.
    c) Do not cut or weld to, building structural members.

G. Secondary pathways

1. Arlington loops or J hooks shall be used for secondary pathways
2. Security wire non-UTP cabling shall be kept separated from the data cabling
3. Provide all necessary anchoring devices and supports.

    a) Use structural supports suitable for equipment, or as indicated.
    b) Check loading and dimensions of equipment with shop drawings.
    c) Do not cut or weld to, building structural members.

H. Conduits (By Div 26)

    a) All conduits shall be EMT unless specifically otherwise indicated.

I. Coordinate extension and connection to commercial, emergency/UPS power circuits provided by Division 26.

1. Make power connections in accordance with Division 26.

J. Shielded and/or screened cables shall be grounded per the hardware manufacturer's instruction.

1. Single point shield grounds shall be grounded at the field panel feeding the device or sub panel and insulated from ground at the termination end of the cable.

K. All installation of security systems shall be complete at least thirty calendar days prior to occupancy.

3.2 RACK AND CABINET INSTALLATION

A. Rack/cabinet installation by Telecommunications contractor.

B. After racks are installed, install all required components to support rack mounted security equipment.

1. Extend UPS/emergency power to rack mounted equipment as required.

C. Install all conduits, back boxes, wire and cable management as required for interconnection of security equipment, data gathering panels, power supply enclosures, and distribution panels in the Security room.

D. Extend commercial/emergency/UPS power circuits as required to security components as required.

E. Neatly lace and dress all cables in each rack.

1. All wiring and cable shall be properly supported.
2. Utilize suitable cable management devices, no tie-wraps for UTP structured cabling allowed.

3.3 GROUNDING AND BONDING

A. Equipment Cabinets and Racks

1. To provide electrical continuity between rack elements, paint-piercing grounding washers shall be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.
2. A horizontal busbar shall be installed at the top and back of each rack for floor fed cabinets/racks.
3. A vertical busbar shall be installed to the rear of the right-hand side rail with thread-forming screws to ensure metal-to-metal contact.
4. Each rack shall be provided with a minimum # 6 AWG insulated ground wire.
5. Do not bond racks serially (loop from rack to rack).
6. Each rack bay against a wall shall be bottom/side ground feeds from the wall.

a) Wall ground feeds/raceways to racks shall not be exposed on the walls.
b) Exception

1) Some rack bays will require the ground to be fed from the ceiling raceway. Refer to drawings for details.

7. The Contractor shall provide a ground strap for each equipment rack and bond to the nearest Telecommunications Bonding Backbone (TBB) connection, Furnish all required bonding materials and hardware manufactured for this purpose.

a) Follow NEC bonding procedures/specifications.

8. All ground raceways within each rack shall be an insulated metallic flex type raceway and shall not interfere with equipment mounting frames or equipment mounting brackets.
9. Each ground feed shall provide proper installation allowances and penetration depths to provide conversion fittings from solid metallic to insulated metallic flex conduit raceways.

10. To bond each rack to ground, burnish clean a one square inch area, drill, tap, apply an adequate amount of antioxidant joint compound mixed for the metal surface types affected, and bolt connectorized conductor to burnished and compounded area.

    a) Ensure proper conductivity.

B. Cable Runway, Cable Raceway and Support System Grounding

1. The Contractor shall provide communications cable tray and cable runway systems with a communications isolated ground from the TBB.
2. All cable tray needs to be electrically continuous per NEC 250.96.

    a) Metal raceways, wire-mesh cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal non-current-carrying parts that are to serve as an alternate grounding path, with or without the use of supplementary equipment grounding conductors, shall be effectively bonded where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them.
    b) Any nonconductive paint, enamel, or similar coating shall be removed at threads, contact points, and contact surfaces, and be connected by means of fittings designed so as to make good bonding points.

3. The Contractor shall provide and install #6 AWG insulated ground wire to bond one end of each cable tray/runway system to the #2/0 TBB.
4. For electrically non-continuous conduits that contain only grounding conductor, the Contractor shall bond the conduit and conductor together at both ends to ground to nearest TGB with grounding bushings or ground clamps.

3.4 Labeling

A. Provide labeling for all security equipment components using waterproof, self-adhesive computer printed labels.

1. Coordinate with Owner on numbering/labeling scheme.

B. Provide labeling for all security cable/wiring using waterproof, self-adhesive computer printed labels.

1. Coordinate with Owner on numbering/labeling scheme.
2. Label all cables/wiring on both ends.
3. At multi conductor cable terminations label each conductor.
4. At a minimum, each cable/wire label shall designate:

    a) Origination Point
    b) Alarm point description
    c) Opening description (if applicable)

C. Provide a complete cable/wire identification plan/list with project completion submittal.

D. Conduit and junction box exteriors may be identified with unique color paint, but shall not be identified with written words that easily identify the function of the conduit and boxes.

3.5 POWER REQUIREMENTS

A. 120 VAC emergency power dedicated to security will be provided. (By Electrical Contractor)

B. Back-up power for all equipment and devices shall be for at least 4 hours unless otherwise specified.

1. When generator backup power is available, provide a UPS, rated to maintain the load for a minimum of 15 minutes for all 120VAC equipment.

C. Rack-mounted Uninterruptible Power Supply (UPS)

1. Provide a UPS to support 120% of the required load to allow for future load expansion and age related deterioration of the battery performance.
2. The UPS interface port shall have an RS-232 communications port and a 10 Base-T Ethernet for LAN management.

a) Provide the necessary data connection, hardware and software to remotely monitor the UPS
b) Provide user configurable computer operating system shutdown capability

3. The control panel shall have a LED status display for load and battery bar graphs in addition to replace battery and overload indicators.

a) Rack-mounted surge suppression shall be vertically mounted and made for this orientation.

D. All electronic locks shall be 12/24VDC (By Division 08)

E. Connect to AC power and provide UL listed power supplies and transformers to distribute low voltage power to the system components as required.

1. Provide uninterrupted battery backup power for the duration required above.

F. All equipment connected to AC circuits shall be protected from power surges.

1. The devices shall be installed and grounded per manufacturer instructions.
2. Equipment protection shall meet requirements of ANSI C62.41.
3. Fuses shall not be used for surge protection.

G. All non-fiber optic data circuits that serve devices exterior to the buildings will be protected by surge protectors at the device and the termination.

1. The devices shall be installed and grounded per manufacturer instructions.
2. Equipment protection shall meet requirements of ANSI C62.41.
3. Fuses shall not be used for surge protection.

3.6 Testing

A. Ensure that all provisions and requirements of this specification are met.

1. Verify through inspections, demonstrations and tests.

B. Perform required tests to demonstrate workmanship, operation, and performance.

1. Conduct tests with Architect/Owner and if required, inspectors of agencies having jurisdiction present.
2. Arrange test dates in advance and give all parties a minimum of 48 hours notice.

C. Repair or replace equipment or systems found defective or inoperative and re-test until 100% satisfactory results are obtained.

D. Verification inspections will be made of all equipment components and installations for proper functioning of locking hardware and lock controls, mounting/placement of sensors, and cameras, etc. to guarantee requirements of the Contract Documents are complied with.

1. The Owner's quality control representative shall have the opportunity to witness all inspections, or to conduct installation inspections of his own.

3.7 Functional Performance Test

A. The Functional Performance Test (FPT) will be conducted at the end of the project and prior to system acceptance by the Owner.

1. The security integrator will provide all necessary staff and communications needed to fully test all functions of the system.
2. The contractor will submit for approval by the Architect and Owner, a comprehensive test plan that will include testing of every function on every door and security device thirty (30) days prior to the scheduled start of the test.
3. The system will not be considered for acceptance prior to the successful completion of the FPT and completion of punch list items.

B. Pre-Testing

1. Following installation and prior to the FPT, the security integrator shall individually test each component and field device and verify the proper functioning of each component within a particular sub-system.

a) The contractor shall also test each sub-system until all detection zones, alarm assessment components, alarm reporting, surveillance and display components; along with access control functions have been verified.
b) Prior to the FPT all deficiencies must be corrected.
c) After sub-system verification is complete, test the entire system to assure that all elements and subsystems are compatible and function properly as a complete system.

C. Upon completion of the outlined tasks and tests the security integrator shall schedule the FPT with the Architect and Owner.

1. The security contractor must demonstrate that the security system components and sub-systems operate together as a system and meet specification requirements in the "As-Installed" operating environment.
2. On conclusion of the FPT the test report document will be submitted to the architect for approval.
3. The FPT will be observed by the architect's and Owner's representatives.

4. The FPT may be stopped at any time by these representatives if they believe the failure rate is too high or the system is not performing to contract document requirements.
5. The FPT will only resume when all deficiencies have been corrected.
6. Retesting will be required of all failed tests.

3.8 System Operational Test

A. Upon completion of the FPT, conduct a formal test to be known as the System Operational Test (SOT), in which all components and sub-systems of the security system are demonstrated to operate error and failure free together as a system.

1. This test is to be performed over a continuous seventy-two (72) hour period.
2. A formal test plan and test procedures shall be prepared by the security subcontractor and submitted to the Owner/Architect for approval.
3. The Security integrator must demonstrate that the system components and sub-systems meet specification requirements in the “As-Installed” operating environment and operate error and failure free for the duration of the test.
4. If a system failure does occur, the failure must be documented and repaired, after which the seventy-two hour SOT period will restart.

B. In the event that the Owner, Architect, or Contractor are required to witness a retest at a later date because the Security integrator is not properly prepared to conduct the acceptance tests or because the systems being tested have failed such tests, which shall be solely determined by the Architect or Owner witnessing the tests, the cost of witnessing additional tests shall be borne exclusively by the Security integrator.

1. Costs are to be based on time and materials at the established rates of the Architect or Owner.

END OF SECTION 28 00 00

SECTION 281000

ELECTRONIC ACCESS CONTROL AND INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY/OVERVIEW

A. This section provides specifications for the installation of Electronic Access Control (AC), Intrusion Detection (ID), and related components.

B. Related Sections

1. Section 087100 Door hardware
2. Section 260000 Electrical (including related sub-sections)
3. Section 270000 Communications (including related sub-sections)
4. Section 280000 Electronic Security
5. Section 282600 Emergency Intercommunications and Duress
6. Section 283100 Fire Alarm and Smoke Detection

1.2 GENERAL SYSTEM DESCRIPTION

A. General Requirements

1. Furnish all labor, materials, tools, equipment, and services for a complete security system as indicated and in accordance with provisions of the contract documents.
2. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.
3. Comply with the provisions of Division 1 for General Requirements.

    a) In the event of a conflict between the provisions of this Section and Division 1, the more stringent provisions shall apply.

4. All system devices and components included shall be compatible.

B. The project shall be equipped with a system that is an extension of an existing **Stanley BASIS ET 693 Release 6.5.624 (Lenel)** system maintained by the Williamson County Police.

1. All work required within the project for extension of the AC/ID system to the existing system head end shall be furnished and installed by the project security contractor.

C. The AC/ID system will support the needs of the project in accordance with these specifications.

1. The AC/ID system shall have the capability for future expansion to support the security needs of the completed complex.

D. The AC/ID system shall be interfaced with the Fire Alarm system (by others) as required to comply with all building code requirements.

E. Emergency/UPS power will be utilized to power the AC/ID system's computer workstation (client) at the Security head end equipment location.

F. Emergency/APS power will be utilized to power the AC/ID system's Data Gathering Panels and control components as required throughout the facility.

1.3 REFERENCES

A. See Section 280000 Electronic Security.

1.4 SYSTEM COORDINATION

A. The Security Integrator shall completely coordinate all relevant work of other trades/systems including, but not limited to:

1. Door hardware
2. Fire Alarm System
3. Electrical Systems(s)
4. Telecommunications System(s)

B. Electric Locking Mechanisms

1. The security integrator and door hardware contractor shall coordinate all door hardware, door and door frame design.
2. The security contractor shall verify all specified door hardware is appropriate for the security application and verify the sequence of operations for each access controlled opening.

C. Fire Alarm and Life Safety

1. The security integrator shall coordinate the access control system design with the life safety consultant to insure compliance with applicable codes and requirements.
2. This includes, but is not limited to:

a) Fire alarm interface
b) Fail safe/fail secure locking mechanisms
c) Delayed egress

1.5 ACCESS CONTROL SYSTEM

A. The AC system will consist of card readers, door position switches, and request-to-exit sensors operating in conjunction with associated electric door hardware.

1. Card readers and adjunct devices shall be provided as shown on the drawings.

a) Provide card readers, Data Gathering Panels <DGP>, and alarm input and output devices connected to the security management system via Local Area Network (LAN).
b) The security integrator shall coordinate network and IP address requirements with Owner to identify the Media Access Control (MAC) address (Layer 2) of each

provided device, the location to be installed, and the port configuration needed for communication.

c) Furnish all labor, materials, tools, equipment, and services for a complete system as indicated and in accordance with provisions of the contract documents.

d) Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.

B. Card readers will work such that upon presentation of a valid AC card, the unique card data shall be transmitted to an associated control panel where the data is compared to an authorized user database and access is approved or rejected accordingly.

1. A valid authorization will activate operation of the electric lock and shunt the door position switch. The alarm shunt will not affect supervision of the detection circuit.
2. Coordinate with owner on card format and other pertinent details.

C. Door position switches at card reader controlled location serve to indicate the open/closed status of the associated door and shall establish the basis for reporting a door-propped or unauthorized entry condition.

1. Provide door position switches as indicated on drawings.
2. Flush mounted door position switches are provided by Division 08 contractor as indicated on drawings.
3. Security contractor is responsible for coordinating the contact configuration (SPDT) (DPDT) and rating for door position switches, and for connection of switches with the AC.

D. Electrified door hardware for card reader controlled doors will include electrified locksets, electric exit devices, and electric power transfer as shown on the drawings.

1. All electrified door hardware shall be provided under the work of Division 08 unless otherwise noted.
2. Security subcontractor shall provide all security cables and, low voltage power supplies for operation of electrified door hardware associated with card reader controlled doors.

E. Request-to-exit (REX) devices at designated card reader controlled doors shall cause the associated door position switches to be shunted.

1. The alarm shunt shall not affect the supervision of the alarm detection circuit.
2. Electrified Lockset shall have an integral REX switch.
3. Electrified Exit devices shall have an integral REX switch.
4. Magnetic Locks shall have a Passive InfraRed (PIR) motion sensor REX device.

a) Wire the PIR to the Door REX Input. The configuration on this motion shall be non-resettable and activate for only 2 seconds.

b) A second set of output contacts for the REX motion sensor shall be wired in series with the power to the lock, disconnecting power to the lock when motion is sensed.

c) The PIR REX shall be mounted and the sensor positioned to avoid detection more than three feet from the door and at the door bottom sweep.

1) Deter under door spoofing attacks by pointing the sensor away from the door threshold. Position the sensor to detect motion at the door handle or door push plate.

d) Connect to REX switch in exit device (by Division 8).

1) Coordinate with Division 8 to ensure proper REX switch configuration
2) Wire the REX switch as described for the above motion sensor to disconnect power to the lock and activate the REX input on the DGP.

e) Doors with out exit devices, a UL listed double pole pushbutton exit switch shall be provided as a redundant REX device.

1) It shall be wired as described for the above motion sensor to disconnect power to the lock and activate the REX input on the DGP.
2) Locate within 6'-0" of the door push-plate/handle.

F. Card Reader Controlled Automatic Sliding 'Storefront' Doors

1. Interface the Card Reader Control Point to the Automatic Sliding 'Storefront' Doors to activate/deactivate locking solenoid and to enable and disable the outside motion detector.
2. The egress motion detector shall always unlock and open the sliding door and send a signal to the system to shunt the notification of an intrusion alarm.

G. Remote Door Release Button

1. Designated doors equipped with electric locking devices that can be released from a remote location through the use of a door release push-button.

a) The momentary push-button shall be interfaced with the request-to-exit signal of the associated card reader to provide momentary release of lock and momentary door alarm shunt.

1.6 INTRUSION DETECTION SYSTEM

A. A series of field installed alarm initiating devices shall be connected to the ID system so that status changes of the devices are transmitted to the security management system.

1. Provide Data Gathering Panels <DGP>, alarm devices, and keypads to be connected to the security management system via Local Area Network (LAN).
2. The security integrator shall coordinate network and IP address requirements with Owner to identify the Media Access Control (MAC) address (Layer 2) of each provided device, the location to be installed, and the port configuration needed for communication.

B. Motion Detector

1. Provide dual technology (microwave and infrared) to prevent false alarms.

a) Specific model depends on application and mounting requirements.
b) One motion detector per zone, do not wire in series.

C. Glass Break Detector

1. Contractor will need to provide compatible glass break tester for device being installed.
2. One glass break detector per zone, do not wire in series.

D. Tamper Switches

1. Typically closed tamper switches to monitor the secure status of all DGP's, power supplies, terminal cabinets, power distribution units, and other Security System cabinets and enclosures.
2. Fasten tamper switches within the cabinet to provide no access to the switch and fasteners when the cabinet is closed.
3. Provide independent monitoring of tamper conditions for each cabinet.

    a) Include the number of tamper switches in the total alarm input figures.

E. Provide ID keypads conveniently located near areas being protected so as to allow devices to arm and disarm.

1.7 SUBMITTALS

A. Follow provisions of Section 280000 additional requirements.

B. Field Test Reports

1. Upon completion and testing of the installed system, test reports shall be submitted in booklet form and electronic media showing all field tests performed on, and adjustments made to each/any component and all field tests performed to prove compliance with the specified performance criteria.
2. Indicate and interpret test results in written form and verbally to owner/DataCom for compliance with performance requirements at a pre-scheduled meeting.

C. Battery calculations to show the expected loads and backup duration for power supplies and UPS devices for all active AC/ID equipment.

D. Security Contractor is responsible to prepare and submit as required to the Authority Having Jurisdiction (AHJ) any and all information to obtain an Electronic Locking Mechanisms permit.

1.8 QUALITY ASSURANCE

A. Follow provisions of Section 280000.

B. Spare Parts:

1. Provide two (2) spare components for every model and configuration of electronic components and devices used on the project as spare parts inventory.

    a) The security integrator will turn over the new and unused components and devices to the owner at project closeout.

1.9 DELIVERY, STORAGE AND HANDLING

A. Follow provisions of Section 280000.

1.10 PROJECT/SITE CONDITIONS

A. Follow provisions of Section 280000.

1.11 WARRANTY

A. Follow provisions of Section 280000.

B. All devices and components shall comply with applicable U.L. standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. AC System Platform

1. Stanley BASIS ET 693 Release 6.5.624 (Lenel)

B. Access Control Data Gathering Panels <DGP>

1. Lenel Intelligent controller
2. Owner Approved Equivalent

C. Proximity Card Readers <CR>

1. HID RP40/15 iCLASS SE
2. Owner Approved Equivalent

D. Door position Switches <DP>

1. Concealed Magnetic Door position Switch

a) Sentrol 1076D
b) Magnasphere MSS-19C/L / MSS-25C/L
c) Detection Systems, Inc
d) Owner Approved Equivalent

2. Surface Mount Door and Hatch Position Switch

a) Sentrol 2500
b) Magnasphere MSS-3XXS
c) Owner Approved Equivalent

3. Overhead Door position Switch

a) Sentrol 2200 (floor)
b) Sentrol 2300 (side)
c) Owner Approved Equivalent

E. Electric Locking Mechanism Power Supply

1. Altronix

2. Alarm-Saf
3. LifeSafety Power
4. Owner Approved Equivalent

F. Uninterruptible Power Supply <UPS>

1. Eaton UPS

a) 5S series for workstations
b) 9170 for rack mounted equipment

2. APC Smart-UPS Series

a) SMT series for workstations
b) Smart-UPS on-Line series for rack mounted equipment

3. MinuteMan

a) Pro series for workstations
b) Enterprise Plus series for rack mounted equipment

4. Owner Approved Equivalent

G. Wire & Cable

1. Belden
2. Windy City
3. General Cable
4. Owner Approved Equivalent

H. Keypads

1. AC/ID System compatible
2. Owner Approved Equivalent

I. Tamper Switches

1. Sentrol 3010
2. Owner Approved Equivalent

J. Dual Technology Motion Detectors

1. AC/ID System compatible
2. Owner Approved Equivalent

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Power Supplies

1. Power supply requirements

    a) A switch and on/off indicator within the power supply cabinet.
    b) Four hours of sealed gel battery backup to provide continuous operation during power failure.

        1) Provide batteries as required to provide specified battery backup time for a fully loaded power supply, regardless of the connected load.

    c) A battery charger to maintain the battery.
    d) Low battery and power fail contacts to monitor the status of the input power and the battery.

        1) Connect each power supply low battery and power fail alarm as a separate alarm input into DGP.

    e) Key lockable wall mount metal enclosure with tamper switch.

2. Additional DGP Power Supply Requirements

    a) The DGP power supply provides power only to DGP's and shall not provide power for locks or any other low voltage device.

3. Additional Electric Locking Mechanism Power Supply Requirements

    a) Fail secure electric locking mechanisms shall remain locked during power failure and fire alarm conditions.
    b) Connect fail safe locking devices in accordance with applicable life safety codes to unlock automatically under the following conditions:

        1) Loss of power to the power supply
        2) Failure of the power supply
        3) Fire alarm activation

    c) Provide power distribution boards with independently fused output relays and fire alarm control panel interface.

4. Additional Device Power Supply Requirements

    a) Provide device power supplies for other security system devices requiring power (e.g. card readers, local alarms, motion sensors, etc.)
    b) Provide power distribution boards with independently fused outputs.

B. Tamper Resistant Screws

1. Provide appropriate screw heads for each application (e.g. countersunk heads for recessed cover plate screws, flat head screws for standard junction box covers, etc.).
2. The security integrator shall provide Torx® tamper resistant screws for:

    a) Junction boxes located above doors
    b) Junction boxes located below ceiling height and/or within reach of hatch ladders
    c) Security device cover plates
    d) Surface mounted door position switches and armored cable

3.2 ENCLOSURE INSTALLATION

A. Enclosures shall be lockable with a tamper switch and installed in a manner to be accessible with clearance to fully open enclosure door.

B. All security panels shall be wired through a dedicated power supply with battery backup.

1. Power to the data gathering panels is to be hardwired utilizing EMT or rigid conduit in accordance with the Electrical specifications.
2. A circuit from the Fire Alarm panel must be installed to each lock power distribution panel.

C. Enclosures shall be installed on designated wall fields in a neat and compact manner to allow for future growth.

D. Enclosures shall be sized to allow for 20% growth in each panel.

E. All panels and boards shall be installed in enclosure(s) suitable to their environment and have sufficient size and orientation to include all system components.

F. Each panel shall be labeled accordance with Owner standards.

The label for each panel shall be posted on the exterior of the panel door.

a) Each panel shall have a list of devices connected to it located on the inside cover.
b) A detailed device layout drawing will be located on the inside of the panel door in an appropriate sleeve and keeper.

3.3 FURTHER REQUIREMENTS

A. Refer to provisions of Section 280000.

B. Furnish and coordinate installation of all special device back boxes and ACID field devices as shown on the security drawings and as specified in this section.

C. The exact installation locations of all equipment shall be coordinated and verified with the Contractor prior to installation.

1. Subcontractor shall notify the Contractor if any location appears to be unsuitable.

D. Provide low voltage power supplies for electric locking devices and ACID devices and components as shown on the security drawings and specified in this Section.

E. Coordinate with the Telecommunications Subcontractor for data network connections, IP address requirements, and telephone circuits as required.

F. Prepare all systems for user operation.

1. The security system must be complete and ready to operate prior to Owner final acceptance of the system.

G. Coordinate with the Owner for all system programming requirements.

H. Perform database programming as required to support the card reader, alarm point, surveillance system integration, and control panel configuration as required.

END OF SECTION 28 10 00

SECTION 282600

EMERGENCY INTERCOMMUNICATIONS AND DURESS

PART 1 - GENERAL

1.1 SUMMARY/OVERVIEW

A. This section provides specifications for the installation of Emergency Intercommunications and Duress (EID) system and related components.

1. Intercoms

B. Related Sections

1. Section 087100 Door Hardware
2. Section 260000 Electrical (including related sub-sections)
3. Section 270000 Communications (including related sub-sections)
4. Section 280000 Electronic Security
5. Section 281000 Electronic Access Control and Intrusion Detection
6. Section 282300 Video Surveillance
7. Section 283100 Fire Alarm and Smoke Detection

1.2 REFERENCES

A. See Section 280000 Electronic Security.

1.3 SYSTEM COORDINATION

A. The Security Integrator shall completely coordinate all relevant work of other trades/systems including, but not limited to:

B. Fire Alarm System

1. Electrical Systems(s)
2. Telecommunications System(s)

C. Fire Alarm and Life Safety

1. The security integrator shall coordinate the EID system with the life safety consultant to insure compliance with applicable codes and requirements.

1.4 GENERAL SYSTEM DESCRIPTION

A. General Requirements

1. Furnish all labor, materials, tools, equipment, and services for a complete system as indicated and in accordance with provisions of the contract documents.
2. Install per manufacturer’s recommendations.

3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.
4. Comply with the provisions of Division 1 for General Requirements.

    a) In the event of a conflict between the provisions of this Section and Division 1, the more stringent provisions shall apply.

5. All system devices and components included shall be compatible.

B. The project shall be equipped with a system that is an extension of an existing system maintained by the Williamson County Police Department

1. All work required within the project for extension of the EID system to the existing system head end shall be furnished and installed by the project security contractor.

C. The EID system will support the needs of the project in accordance with these specifications.

1. The EID system shall have the capability for future expansion to support the security needs of the completed complex.

D. EID systems utilized for life safety shall comply with all applicable codes.

E. Emergency/UPS power will be utilized to power the EID system's components at the Security head end equipment location.

1.5 IP Based Video Intercom System

A. Computer Based Master Station

1. Provide PTZ control of substation camera
2. Hands-free VOX communication
3. Door release control
4. Provide software and install on owner provided PCs
5. Provide microphone and speakers for owner provided PCs

B. Hardware Based Master Station

1. Provide PTZ control of sub station camera
2. Handset or Hands-free VOX/ PTT communication
3. Door release control
4. Wall or Desk Mounting
5. PoE (802.3af) powered

C. Video Sub Station

1. Digital PTZ color camera
2. Dry Contact for Door Release
3. LED illumination for nighttime viewing
4. IP addressable
5. PoE (802.3af) powered

D. Control Unit (as required)

1. Rack mounted

1.6 DURESS PANIC BUTTONS

A. The Duress panic button is a switch that allows an individual to covertly send a duress signal, with no visible or audible indication when activated.

1. Wired Duress Button

a) Switch shall have a shroud over the activating lever that locks in activated position until reset with a key or have two buttons that must be press simultaneously to send alarm
b) Provide full integration of the subsystem's receivers and transmitters to the AC/ID system

1) Provide individual alarm notification for fault, low battery, transmitter missing, as well as all other transmitter and receiver failures.
2) Provide alarm logging
3) Provide camera call-up capability

1.7 SUBMITTALS

A. Follow provisions of Section 280000 additional requirements.

1.8 QUALITY ASSURANCE

A. Follow provisions of Section 280000.

B. Spare Parts:

1. Provide two (2) spare components for every model and configuration of electronic components and devices used on the project as spare parts inventory.

a) The security integrator will turn over the new and unused components and devices to the owner at project closeout.

1.9 DELIVERY, STORAGE AND HANDLING

A. Follow provisions of Section 280000.

1.10 PROJECT/SITE CONDITIONS

A. Follow provisions of Section 280000.

1.11 WARRANTY

A. Follow provisions of Section 280000.

B. All devices and components shall comply with applicable U.L. standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SYSTEM MANUFACTURERS

A. Video Intercom System

1. Aiphone
2. Commend
3. Stentofon

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Power Supplies

1. Provide device power supplies for all security system devices requiring power
2. Emergency Phone power shall be provided via PoE
3. Provide power distribution boards with independently fused outputs.
4. Power supply requirements:

a) Sealed gel battery backup to provide continuous operation during power failure.

1) Provide batteries as required to provide specified battery backup time for a fully loaded power supply, regardless of the connected load.

b) A battery charger to maintain the battery.
c) Low battery and power fail contacts to monitor the status of the input power and the battery.
d) Key lockable wall mount metal enclosure with tamper switch.

B. Tamper Resistant Screws

1. Provide appropriate screw heads for each application (e.g. countersunk heads for recessed cover plate screws, flat head screws for standard junction box covers, etc.).
2. The security integrator shall provide Torx® tamper resistant screws for:

a) Security device cover plates
b) Duress buttons

3.2 FURTHER REQUIREMENTS

A. Refer to provisions of Section 280000.

B. Furnish and coordinate installation of all special device back boxes and field devices as shown on the security drawings and as specified in this section.

C. The exact installation locations of all equipment shall be coordinated and verified with the Contractor prior to installation.

1. Subcontractor shall notify the Contractor if any location appears to be unsuitable.

D. Labeling

1. Provide labeling suitable to Owner for all major equipment components.

a) Coordinate with Owner on numbering scheme to match existing.

2. Provide labeling for all security equipment racks and enclosures.
3. Provide labeling for all security device wiring.

a) Label all cables and wiring using waterproof, self-adhesive computer printed labels. Label both ends of each cable.
b) At multi conductor cable terminations label each conductor.

E. Coordinate with the Telecommunications Subcontractor for data network connections and telephone circuits as required.

F. Prepare all systems for user operation.

1. The security system must be complete and ready to operate prior to Owner final acceptance of the system.

G. Coordinate with the Owner for all system programming requirements.

H. Perform database programming as required to support the security sub-system integration, and control panel configuration as required.

END OF SECTION 28 26 00

SECTION 31 00 05

CIVIL AND SITE WORK

Specifications for Civil and Site work shall be the City of Georgetown, Texas, *Construction Specifications and Standards Manual*, current as of the date of plan approval, unless otherwise indicated on the drawings.

"Items No." and "Standard Detail" referenced in these construction drawings are from the City of Georgetown Standard Specifications and Details and shall be applicable to this work as required.

Methods of measurement and payment and pay items described in the City of Georgetown Standard Specifications are not applicable to this project unless otherwise indicated in Division 1 of these documents.

All pipe testing and re-testing to be performed by Contractor at his/her own expense.

City of Georgetown Construction Specifications and Standards Manual can be obtained at

City of Georgetown
Planning & Development Department
406 W. 8th St
Georgetown, Texas 78626

Or at:
https://files.georgetown.org/construction-specifications-drainage-criteria/

END OF SECTION

SECTION 31 31 16

TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil treatment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
   2. Include the EPA-Registered Label for termiticide products.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of termite control product.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Termiticide brand name and manufacturer.
   4. Quantity of undiluted termiticide used.
   5. Dilutions, methods, volumes used, and rates of application.
   6. Areas of application.
   7. Water source for application.

D. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.

1.5 FIELD CONDITIONS

A. Soil Treatment:
   1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
   2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Corporation, Agricultural Products; Termidor.
      b. Bayer Environmental Science; Premise 75.
   2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
   1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.
   1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
   2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
   3. Masonry: Treat voids.
   4. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.5 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of termite-control-treatment Installer. Include semiannual maintenance as required for proper performance according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION

AGREEMENT
BETWEEN OWNER AND CONTRACTOR

The **Owner**: Williamson County
710 Main Street, Ste. 101
Georgetown, Texas 78626

and **Contractor** _____
_____
_____ _____

for the **Project**: _____
_____
_____ _____

Architect: _____
_____
_____ _____

AGREEMENT, this Agreement Between Owner and Contractor (hereinafter called "Agreement") is entered into effective as of the date indicated herein below and all attachments (the "Effective Date"), by and between Williamson County a political subdivision of the State of Texas (hereinafter called the "Owner") and _____ (hereinafter called "Contractor").

WHEREAS, the Owner desires to retain a Contractor for the _____ (hereinafter called the "Project"),

WHEREAS, the Owner desires a Contractor who will render, diligently and competently in accordance with the highest standards used in the profession, all Contractor services which shall be necessary or advisable for the expeditious, economical and satisfactory completion of the Project, and

NOW, THEREFORE, in consideration of the mutual undertakings herein contained, the parties hereto agree as follows:

ARTICLE 1 SCOPE OF WORK

The Contractor has overall responsibility for and shall provide complete construction services and furnish all materials, equipment, tools and labor as necessary or reasonably inferable to complete the Work, or any phase of the Work, in accordance with the Specifications and Drawings for the Project and the Owner's requirements. The Specifications and Drawings were prepared for Williamson County by the Architect. The Contractor shall do everything required by the Contract Documents.

ARTICLE 2 CONTRACT DOCUMENTS

2.1 The Contract Documents consist of the following, which are incorporated by reference for all purposes:

a. This Agreement and all exhibits and attachments listed, contained or referenced in this Agreement;
b. The Uniform General Conditions for Williamson County ("General Conditions");
c. The Supplementary or Special Conditions, if any;
d. All Addenda issued prior to the Effective Date of this Agreement;
e. The Bid/Proposal Documents as defined by the Invitation for Bidders/Request for Proposals;
f. All Change Orders issued after the Effective Date of this Agreement;
g. Minimum Insurance Coverages and Minimum Coverage Amounts, which is attached here to as **Exhibit 1**; and
h. The Drawings, Specifications, details and other documents developed by Architect to describe the Project and accepted by Owner, which are attached hereto **Exhibit 2**.

2.2 The Contract Documents form the entire and integrated Contract and Agreement between Owner and Contractor and supersede all prior negotiations, representations or agreements, written or oral. Contractor acknowledges receipt of all Contract Documents as of the date of its execution hereof.

2.3 The term "Contractor" shall be interchangeable with the terms "Proposer," "Bidder," Respondent" and "General Contractor" or other similar terms as appropriate in the Contract Documents.

ARTICLE 3 CONTRACT TIME

The Owner shall provide a Notice to Proceed in which a date for commencement of the work shall be started. The Contractor shall achieve Substantial Completion of the Work within _____ (_____) calendar days after such commencement date, as such completion date may be extended by approved Change

Orders. Unless otherwise specified in writing, Contractor shall achieve Final Completion within _____ (_____) calendar days of Substantial Completion. The time set forth for completion of the work is an essential element of the Contract.

ARTICLE 4 CONTRACTOR REPRESENTATIONS

4.1 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bid/Proposal Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local laws and regulations that may affect cost, progress, and performance of the Work.

D. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.

E. Based on the information and observations referred to in Paragraph 4.1.D above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

F. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

G. Contractor has given Architect written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Architect is acceptable to Contractor.

H. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 5 THE CONTRACT PRICE; OWNER'S CONSTRUCTION CONTINGENCY

5.1 Contract Price. Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amount of **$**_____

5.2 Contract Payments. Method and terms of payment of the Contract Price shall be in accordance with the Contract Documents.

5.3 Owner's Construction Contingency. The following lump sum amount shall serve as the Owner's Construction Contingency from which changes in the Work are to be paid in accordance with the General Conditions:

$_____

The Owner's Construction Contingency is controlled solely by the Owner and such amount is not included in the Contract Price set out in 5.1 above. Expenditures from the Owner's Construction Contingency must be made by Change Order issued by the Architect and approved by the Owner in accordance with the General Conditions. Contractor shall not be entitled to any compensation from the any unused amounts of the Owner's Construction Contingency.

5.4 Allowable Overhead and Profit Markup on Changes in the Work. In case of an increase in the Contract Price due to a change in the Work and in accordance with § 7.3.7 of the General Conditions, the amounts Contractor may add to the pricing of a change for overhead and profit are as follows:

a. For Work performed directly by Contractor with its Own Employees: Contractor may add up to 15% for Work performed directly by Contractor for any specific change.

b. For Managing Subcontracted Work: Contractor may add up to 10% for managing subcontracted Work for any specific change.

Only one percentage, referenced above, shall be used for the purpose of calculating the markup for a specific change amount. On changes involving both additions and deletions,

the allowed markup will be allowed only on the net addition. The allowed markup shall cover all overhead expenses and profit of any kind relating to the specific change.

ARTICLE 6 TIME

6.1 TIME LIMITS STATED IN THE CONTRACT DOCUMENTS ARE OF THE ESSENCE OF THIS AGREEMENT.

6.2 Unless otherwise approved in writing, the Owner and the Contractor shall perform their respective obligations under the Contract Documents as expeditiously as is consistent with reasonable skill and care and the orderly progress of the Work.

6.3 Liquidated Damages. Contractor and Owner recognize that time is of the essence and that Owner will suffer financial loss if the Work is not completed within the times specified in Article 3 above, plus any extensions thereof allowed in accordance with the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, for each consecutive calendar day after the date of Substantial Completion that the Work is not substantially completed, the Owner may deduct the amount of:

Five Hundred Dollars per calendar day ($500.00/calendar day)

from any money due or that becomes due the Contractor, not as a penalty but as liquidated damages representing the parties' estimate at the time of contract execution of the damages that the Owner will sustain for late completion. The parties stipulate and agree that calculating Owner's actual damages for late completion of the Project would be impractical, unduly burdensome, and cause unnecessary delay and that the amounts of daily liquidated damages set forth are reasonable. Contractor expressly agrees that the amounts of daily liquidated damages are a reasonable forecast of the actual damages Owner will incur due to any such delay.

ARTICLE 7 NOTICES

Notices of claims, disputes or other legal notices shall be in writing and shall be deemed to have been given when delivered in person to the representative of the Contractor or Owner for whom it is intended, as set out below or sent by U. S. Mail to the representative of the Contractor or Owner for whom it is intended, as set out below. Mail notices are deemed effective upon receipt or on the third business day after the date of mailing, whichever is sooner.

If to Owner: Williamson County Judge
710 Main Street, Ste. 101
Georgetown, Texas 78626

with copy to: Hal C. Hawes
General Counsel to the
Williamson County Commissioners Court
710 Main Street, Suite 102
Georgetown, Texas 78626

If to Contractor: _____
_____
_____ _____

The parties may make reasonable changes in the person or place designated for receipt of notices upon advance written notice to the other party.

ARTICLE 8 PARTY REPRESENTATIVES

The Owner's Designated Representative (sometimes referred to as the "ODR") authorized to act in the Owner's behalf with respect to the Project is:

_____
_____
_____ _____
Phone (512) _____
Fax (512) _____

The Contractor's designated representative authorized to act on the Contractor's behalf and bind the Contractor with respect to the Project is:

_____
_____
_____ _____
Phone (512) _____
Fax (512) _____

The parties may make reasonable changes in their designated representatives upon advance written notice to the other party.

ARTICLE 9 ENTIRE AGREEMENT

This Agreement supersedes all prior agreements, written or oral, between Contractor and Owner and shall constitute the entire agreement and understanding between the parties with respect to the Project. This Agreement and the terms of the Contact Documents shall

be binding upon the parties and may not be waived, modified, amended or altered except by a writing signed by Contractor and Owner.

BY SIGNING BELOW, the Parties have executed and bound themselves to this Agreement to be effective as of the date of the last party's execution below (the "Effective Date").

WILLIAMSON COUNTY Williamson County, Texas,	_____, a Texas _____,
By: _____	By: _____
Printed Name: _____	Printed Name: _____
Title: _____	Title: _____
Date: _____ ____, 20____	Date: _____ ____, 20____

EXHIBIT 1

Minimum Insurance Coverages
and
Minimum Coverage Amounts

A. All policies of insurance provided by the Contractor must comply with the requirements of this Exhibit, the Contract Documents and the laws of the State of Texas.

B. The Contractor shall provide and maintain, until the Work covered in the Agreement Between Owner and Contractor is completed and accepted by the Owner, the minimum insurance coverages in the minimum amounts as described below. Coverage shall be written on an occurrence basis by companies authorized and admitted to do business in the State of Texas and rated A- or better by A.M. Best Company, or otherwise acceptable to Owner.

	Type of Coverage	Limits of Liability
1.	Worker's Compensation	Statutory
2.	Employer's Liability	
	Bodily Injury by Accident	$500,000 Ea. Accident
	Bodily Injury by Disease	$500,000 Ea. Employee
	Bodily Injury by Disease	$500,000 Policy Limit

3. Comprehensive general liability including completed operations and contractual liability insurance for bodily injury, death, or property damages in the following amounts:

COVERAGE	PER OCCURRENCE
Comprehensive General Liability (including premises, completed operations and contractual)	$1,000,000
Aggregate policy limits:	$2,000,000

4. Comprehensive automobile and auto liability insurance (covering owned, hired, leased and non-owned vehicles):

COVERAGE	PER PERSON	PER OCCURRENCE
Bodily injury (including death)	$1,000,000	$1,000,000

Property damage	$1,000,000	$1,000,000
Aggregate policy limits	No aggregate limit	

5. Builder's Risk Insurance (all risks)
An all risk policy, in the amount equal at all times to 100% of the Contract Price or Contract Sum. The policy shall be issued in the name of the Contractor and shall name its Subcontractors as additional insureds. The Owner shall be named as a loss payee on the policy. The builders risk policy shall have endorsements as follow:

a. This insurance shall be specific as to coverage and not considered as contributing insurance with any permanent insurance maintained on the present premises. If off-site storage is permitted, coverage shall include transit and storage in an amount sufficient to protect property being transported or stored.

b. This insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, caused by certified acts of terrorism as defined in the Terrorism Risk Insurance Act, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss as well as coverage for building materials while in transit or building materials suitably stored at a temporary location. Property insurance provided by the Contractor shall not cover any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, and other similar items commonly referred to as construction equipment that may be on the site and the capital value of which is not included in the Work. The Contractor shall make its own arrangements for any insurance it may require on such construction equipment. Any such policy obtained by the Contractor under this section shall include a waiver of subrogation in accordance with the requirements of Section 11.3.4 of the General Conditions.

C. For renovation projects and or portions of work contained within an existing structure, the Owner waives subrogation for damage by fire to existing building structure(s), if the Builder's Risk Policy has been endorsed to include coverage for existing building structure(s) in the amount described in the Special Conditions. However, Contractor shall not be required to obtain such an endorsement unless specifically required by the

Special Conditions in the Contract Documents. The aforementioned waiver of subrogation shall not be effective unless such endorsement is obtained.

6. Flood insurance when specified in Supplementary General Conditions or Special Conditions.

7. Umbrella coverage in the amount of not less than $5,000,000.

C. Workers' Compensation Insurance Coverage:

a. Definitions:

(1) Certificate of coverage ("certificate") - A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Texas Workers' Compensation Commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the Project.
(2) Duration of the Project - includes the time from the beginning of the work on the Project until the Contractor's/person's work on the Project has been completed and accepted by the Owner.
(3) Coverage – Workers' compensation insurance meeting the statutory requirements of the Texas Labor Code, §401.011(44).
(4) Persons providing services on the Project ("subcontractor") - includes all persons or entities performing all or part of the services the Contractor has undertaken to perform on the Project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the Project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

b. The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, §401.011(44) for all employees of the Contractor providing services on the Project, for the duration of the Project.
c. The Contractor must provide a certificate of coverage prior to execution of the Agreement Between Owner and Contractor, and in no event later than ten (10)

days from Notice of Award. Failure to provide the insurance in a timely fashion may result in loss of Contractor's bid bond.

d. If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the Owner showing that coverage has been extended.
e. The Contractor shall obtain from each person providing services on a project, and provide to the Owner:

(1) a certificate of coverage, prior to that person beginning work on the Project, so the Owner will have on file certificates of coverage showing coverage for all persons providing services on the Project; and
(2) no later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

f. The Contractor shall retain all required certificates of coverage for the duration of the Project and for one year thereafter.
g. The Contractor shall notify the Owner in writing by certified mail or personal delivery, within 10 days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.
h. The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

i. The Contractor shall contractually require each person with who it contracts to provide services on a project, to:

(1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas labor Code, Section 401.011(44) for all of its employees providing services on the Project, for the duration of the Project;
(2) provide to the Contractor, prior to that person beginning work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project, for the duration of the Project;
(3) provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;

(4) obtain from each other person with whom it contracts, and provide to the Contractor:

a. a certificate of coverage, prior to the other person beginning work on the Project; and

b. a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;

(5) retain all required certificate of coverage on file for the duration of the Project and for one year thereafter;

(6) notify the Owner in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and

(7) contractually require each person with whom it contracts, to perform as required by paragraphs (1)-(7), with the certificates of coverage to be provided to the person for whom they are providing services.

j. By signing the Agreement Between Owner and Contractor or providing or causing to be provided a certificate of coverage, the Contractor is representing to the Owner that all employees of the Contractor who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

k. The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the Owner to declare the Agreement Between Owner and Contractor void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the Owner.

D. If insurance policies are not written for the amounts specified in this Exhibit, Contractor shall carry Umbrella or Excess Liability Insurance for any differences in amounts specified. If Excess Liability Insurance is provided, it shall follow the form of primary coverage.

E. The furnishing of the above listed insurance coverage, as may be modified by the Contract Documents, must be tendered prior to execution of the Agreement Between Owner and Contractor, and in no event later than ten (10) days from Notice of Award. Failure to provide the insurance in a timely fashion may result in loss of Contractor’s bid bond.

F. Owner shall be entitled, upon request and without expense, to receive copies of the policies and all endorsements as they apply to the limits set out in this Exhibit.

G. Contractor shall be responsible for payment of premiums for all of the insurance coverages required under this Exhibit. Contractor further agrees that for each claim, suit or action made against insurance provided hereunder, with respect to all matters for which the Contractor is responsible hereunder, Contractor shall be solely responsible for all deductibles and self-insured retentions. Any deductibles or self-insured retentions over **$75,000** in the Contractor's insurance must be declared and approved in writing by Owner in advance.

EXHIBIT 2 –DRAWINGS AND SPECIFICATIONS

FOR

_____

LIST OF DRAWINGS

DWG	DRAWING TITLE	ISSUE DATE

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For
TECHNICAL SPECIFICATION SECTIONS

DIVISION 1

END OF TECHNICAL SPECIFICATIONS

UNIFORM GENERAL CONDITIONS
FOR WILLIAMSON COUNTY

TABLE OF ARTICLES

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract as revised, Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Owner or the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor.

§ 1.1.3 THE WORK
The term “Work” means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT
The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS
The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS
The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE
Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect’s consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 KNOWLEDGE: The terms "knowledge," "recognize," and "discover," their respective derivatives, and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize), and discovers (or should discover) in exercising the care, skill, and diligence required by the Contract Documents. Analogously, the expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor familiar with the Project and exercising the care, skill, and diligence required of the Contractor by the Contract Documents.§1.1.10 PRODUCT: Materials, systems, and equipment incorporated or to be incorporated in the Work.

§1.1.9 PROVIDE: Furnish and install and shall include, without limitation, labor, materials, equipment, transportation, services and other items required to complete the referenced tasks.

§1.1.02 FURNISH: Pay for, deliver (or receive), unload, inspect, and store products, materials, equipment, and accessories as specified while retaining care, custody and control until received for installation based on a signed receipt.

§ 1.1.11 INSTALL: Receive, unload, inspect, and store as specified while retaining care, custody and control; set or place in position, make required connections; and adjust and test as specified in the Contract Documents for satisfactory performance and operation.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS
§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. 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 Contractor shall (i) provide the better quality or greater quantity of Work or (ii) comply with the more stringent requirement; either or both in accordance with the Owner or the Architect’s

interpretation. The terms and conditions of this Section 1.2.1, however, shall not relieve the Contractor of any of the obligations set forth in the Contract Documents.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.3.1 Whenever a product is specified in accordance with a Federal Specification, an ASTM Standard, an American National Standards Institute Specification, or other Association Standard, the Contractor, if required by the Specifications or if requested by the Owner, shall present evidence from the manufacture, certifying the product complies with the particular Standard or Specification. When required by the Contract Documents, supporting data shall be submitted to substantiate compliance.

§ 1.2.3.2 Whenever a product is specified or shown by describing proprietary items, model numbers, catalog numbers, manufacturer, trade names, or similar reference, no substitutions may be made unless accepted in strict accordance with the Substitution requirements stated in the Specifications or, if no Substitution requirements are stated in the Specifications, in accordance with the requirements stated elsewhere in the Contract Documents. Where two or more products are shown or specified, the Contractor has the option to use either of those shown or specified.

§ 1.3 CAPITALIZATION
Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION
In the interest of brevity the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 USE OF DRAWINGS AND OTHER INSTRUMENTS OF SERVICE
§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights, except as provided in the Owner-Architect Agreement. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect’s consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM
If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall establish the necessary protocols governing such transmissions in writing, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

The Owner means Williamson County acting through any duly authorized representative as provided in the Agreement, and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization ("Owner's Designated Representative"). The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.2 OWNER

§ 2.2.1 Appropriation of Funds by Owner. Owner believes it has sufficient funds currently available and authorized for expenditure to finance the costs of the Agreement between Owner and Contractor. Contractor understands and agrees that the Owner's payment of amounts under the Agreement between Owner and Contractor is contingent on the Owner receiving appropriations or other expenditure authority sufficient to allow the Owner, in the exercise of reasonable administrative discretion, to continue to make payments under the Agreement.

§ 2.2.2 Unless specifically stated otherwise in the Contract Documents, Contractor shall secure and pay for necessary permits, approvals, assessments, and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. Except for surveys or grade information, the Contractor shall compare the information furnished by the Owner, including, but not limited to, soil tests, with visibly observable physical conditions and the Contract Documents and, on the basis of such review, promptly report to the Owner and the Architect any known conflicts, errors or omissions. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§2.5 EXTENT OF OWNER RIGHTS

§ 2.5.1 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (i) granted in the Contract Documents, (ii) at law, or (iii) in equity.

§ 2.5.2 In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

§ 2.6 OWNER'S RIGHT TO RECORDS

§ 2.6.1 The Contractor's records, which shall include but not be limited to accounting records, written policies and procedures, subcontractor files (including proposals of successful bidders), original estimates, estimating work sheets, correspondence, schedules, change order files (including documentation covering negotiated settlements), and any other supporting evidence necessary to substantiate charges related to this contract (all foregoing hereinafter referred to as "records") and shall be open to inspection and subject to audit and/or reproduction, during normal working hours, by Owner's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by the Contractor or any of his payees. Such records subject to examination shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with this Contract.

§ 2.6.2 For the purpose of such audits, inspections, examinations and evaluations, the Owner's agent, or authorized representatives shall have access to said records from the effective date of this Contract for the duration of Work and until three (3) years (or longer if required by law) after the date of final payment by Owner to Contractor.

§ 2.6.3 Owner's agent or its authorized representative shall have access during normal business hours to the Contractor's facilities, shall have access to all necessary records and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this Article 2.6. Owner's agent or authorized representative shall give auditees reasonable advance notice of intended audits.

§ 2.6.4 Contractor shall require all subcontractors, insurance agents, and material suppliers (payees) with cost plus contracts, if permitted, and not fixed price contracts to comply with the provisions of this Article by insertion of the requirements hereof in a written contract agreement between Contractor and payee. Failure to obtain such written contracts which include such provisions shall be reason to exclude some or all of the related payee's costs from amounts payable to the Contractor pursuant to this contract.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative, and if these General Conditions are used in conjunction with the Agreement between Owner and Construction Manager-At-Risk, the term "Contractor" shall mean the Construction Manager.

§ 3.1.2 The Contractor shall perform the Work in strict accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents. Prior to execution of the Agreement, the Contractor and each Subcontractor shall have evaluated and satisfied themselves as to the observable conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Section 10.3, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or the Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Section 3.2.1.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Owner and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner. The Contractor shall verify the accuracy of elevations, dimensions, locations, and field measurements. In all cases of the interconnection of its Work with existing or other Work, the Contractor shall verify at the site all dimensions relating to such existing or other Work.

.1 All of Contractor's work shall conform to the Contract Documents. Contractor shall be responsible for the details of the Work necessary to carry out the intent of the drawings and specifications, or which are customarily performed. When more detailed information is required for performance of the Work or when an interpretation of the Contract Documents is requested, the Contractor shall submit a written request for information to the Architect or Owner (as required), and the Owner or Architect shall furnish such information or interpretation. Where only part of the Work is indicated, similar parts shall be considered repetitive. Where any detail is shown and components thereof are fully described, similar details not fully described shall be considered to incorporate the fully described details and components.

.2 The Contractor has had an opportunity to examine, and has carefully examined, all of the Contract Documents and Project site, and has fully acquainted itself with the scope of work, design, availability of materials, existing facilities, access, general topography, soil structure, subsurface conditions, obstructions, and all other conditions pertaining to the Work, the site of the Work, and its surrounding; that it has made necessary investigations to a full understanding of the difficulties which may be encountered in performing the Work; and that anything in any Contract Documents, or in any representations, statements, or information made or furnished by Owner or its representatives notwithstanding, Contractor will complete the Work for the compensation stated in the Agreement. In addition thereto, Contractor represents that it is fully qualified to do the Work in accordance with the terms of this Agreement in the time specified.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Owner and the Architect any nonconformity discovered by or made known to the Contractor as a request for information.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 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 loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 Inspection of the progress, quantity, or quality of the Work done by the Owner, any Owner's representative, any governmental agency, or the Architect, or any inspector, shall not relieve the Contractor of any responsibility for the compliance of the Work with the Contract Documents. The Owner or its approved representative (heretofore referred to as Owner's representative) shall have access to the worksite and all Work. No supervision or inspection by the Owner's representative, nor the authority to act nor any other actions taken by the Owner's representative shall relieve the Contractor of any of its obligations under the Contract Documents nor give rise to any duty on the part of the Owner.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.1.1 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, and are not representations that qualified labor adequate to perform the Work is available locally at the prevailing wage rates. The Owner is not bound to pay—and 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 Documents. 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.

.1 For classifications not shown, workers shall not be paid less than the wage indicated for Laborers. The Contractor shall notify each worker commencing work on the Project 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 by Owner, competent evidence of compliance with the Texas Prevailing Wage Law shall be furnished by Contractor.

.2 A copy of each worker wage rate notification shall be submitted to the Owner with the Application for Payment for the period during which the worker began on-site activities.

§ 3.4.1.2 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 and shall specify a wage rate for that skill or trade, which shall bind the Contractor.

§ 3.4.1.3 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 §3.4.1.2. 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.

§ 3.4.1.4 Complaints of Violations of Prevailing Wage Rates. Within 31 days of receipt of information concerning a violation of Chapter 2258 of the 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.

§ 3.4.1.5 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. & Rem. 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.

§ 3.4.1.6 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 this Article 3.4 and the amount owed the worker. The Owner may use any amounts retained hereunder 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, attorneys' fees and court costs. The Contractor shall promptly furnish a copy of the arbitration award to the Owner.

§ 3.4.1.7 Prevailing Wage Retainage. Money retained pursuant to this Article 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.

§ 3.4.1.8 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 this Article 3.4.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Owner or Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. If the Contractor desires to submit an alternate product or method in lieu of what has been specified or shown in the Contract Documents, the Contractor shall comply with the Substitution requirements listed in the Specifications, or if there are no Substitution requirements listed in the Specifications, then the following provisions apply:

§ 3.4.2.1 The Contractor must submit to the Architect and the Owner (i) a full explanation of the proposed substitution and submittal of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other like information necessary for a complete evaluation of the substitution; (ii) the adjustment, if any, in the Contract Sum, in the event the substitution is acceptable; (iii) the adjustment, if any, in the time of completion of the Contract and the construction schedule in the event the substitution is acceptable; and (v) a statement indicating Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect. Proposals for substitutions shall be to the Architect in sufficient time to allow the Architect no less than ten (10) working days for review. No substitutions will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated hereinbefore.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project.

§ 3.4.5. In case the progress of the Work is affected by any undue delay in furnishing or installing any items or materials or equipment required under the Contract Documents because of such conflict involving any such labor agreement or regulation, the Owner may require that other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive.

§ 3.5 WARRANTY

§ 3.5.1 The Contractor warrants to the Owner: (1) that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise; (2) that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit; (3) that the Work will be done strictly in accordance with the Contract Documents; (4) that all products are installed

per the manufacturer's instructions, and in such a way that the manufacturer's warranties are preserved, including the use of a manufacturer-certified installer, if required by the manufacturer; (5) and that the Work, when finally completed, will provide a complete Project that meets the intent of the Contract Documents. The Contractor represents and warrants to the Owner that its materials and workmanship, including without limitation, construction means, methods, procedures and techniques necessary to perform the Work, use of materials, selection of equipment and requirements of product manufacturers are and shall be consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to the Work; (3) requirements of any warranties applicable to the Work subject to Paragraph 3.2.3. Work, materials, or equipment not conforming to these requirements shall be considered defective, and promptly after written notification of non-conformance shall be repaired or replaced by Contractor with Work conforming to this warranty. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Owner or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.1.1 Contractor further warrants that all materials or equipment of a category or classification will be a product of the same manufacturer and such materials or equipment shall be of the same lot, batch or type and that such materials and equipment will be as specified.

§ 3.5.2 The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties.

§ 3.6 TAXES

State Sales and Use Taxes. Sales, use or similar taxes imposed by a governmental authority that are related to the Work and for which the Contractor is liable; provided, however, Owner is a body corporate and politic under the laws of the State of Texas and claims exemption from sales and use taxes under Texas Tax Code Ann. § 151.309, as amended, and the services and materials subject of the Agreement are being secured for use by Owner. Exemption certificates will be provided to Contractor upon request. As a precondition to the Owner reimbursing Contractor for allowable sales and use taxes, Contractor must, on its own, first attempt to use such tax exemption certificates in order to assert the exemption. In the event Contractor's efforts to use the tax exemption certificate is unsuccessful and provided that under the laws of the State of Texas an exemption from sales and use taxes is allowed, Owner will reimburse Contractor for such sales and use taxes upon Contractor providing sufficient and satisfactory documentation to the Williamson County Auditor.

§ 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided, the Contractor shall secure, pay for, and, as soon as practicable, furnish the Owner with copies or certificates of all permits and fees, licenses, and inspections necessary for the proper execution and completion of the Work, including, without limitation, all building permits. All connection charges, assessments, or inspection fees as may be imposed by any municipal agency or utility company are included in the Contract Sum and shall be the Contractor's responsibility.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction and damages resulting therefrom.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from

those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Owner will promptly investigate such conditions and, if the Owner determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will authorize an equitable adjustment in the Contract Sum or Contract Time, or both. If the Owner determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Owner shall promptly notify the Contractor in writing, stating the reasons. If the Contractor disputes the Owner's determination, the Contractor party may assert a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contractor shall, prior to purchasing any such materials, notify the Owner in writing of the cost and whether such cost will exceed the amount of the allowance. If Owner authorizes Contractor to proceed, after receiving the Contractor's estimate of the total cost, then the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent or Contractor's project manager shall be as binding as if given to the Contractor. Important oral communications shall be immediately confirmed in writing.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Owner or Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Owner and Architect require additional time to review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, as provided in the Agreement, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 The construction schedule shall be a detailed precedence-style critical path management ("CPM") schedule in a format satisfactory to the Owner that shall (i) provide a graphic representation of all activities and events that will occur during performance of the Work; (ii) identify each phase of construction and occupancy; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as the "Milestone Date"). Upon review and acceptance by the Owner of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions as set forth in section 3.10.1 or if requested by the Owner. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorize pursuant to a Change Order.

§ 3.10.5 In the event the Owner determines that the performance of the Work, as of a Milestone Date, has not progressed or reach the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities, and (iii) other similar measures. Such measures so continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require such measures is solely for the purpose of ensuring the Contractors compliance with the construction schedule.

§ 3.11 DOCUMENTS AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or

equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly as required by the Contract Documents. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Owner and Architect shall, at all times, have access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 INDEMNITY – OTHER THAN EMPLOYEE PERSONAL INJURY CLAIMS. TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR SHALL INDEMNIFY, DEFEND, AND HOLD HARMLESS OWNER, ITS EMPLOYEES, AND ASSIGNS (THE "INDEMNIFIED PARTIES" OR "INDEMNITEES") FROM AND AGAINST CLAIMS, DAMAGES, LOSSES AND EXPENSES, INCLUDING BUT NOT LIMITED TO ATTORNEYS' FEES, ARISING OUT OF OR ALLEGED TO BE RESULTING FROM THE PERFORMANCE OF THIS AGREEMENT, TO THE EXTENT CAUSED BY THE NEGLIGENT OR WILLFUL ACTS OR OMISSIONS OF THE CONTRACTOR, SUBCONTRACTORS, SUB-SUBCONTRACTORS, OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE. CONTRACTOR SHALL NOT BE REQUIRED TO INDEMNIFY, HOLD HARMLESS OR DEFEND THE INDEMNIFIED PARTIES AGAINST A CLAIM CAUSED BY THE NEGLIGENCE OR FAULT, OR THE BREACH OR VIOLATION OF A STATUTE, ORDINANCE, GOVERNMENTAL REGULATION, STANDARD, OR RULE OF THE INDEMNITEE, OR OTHER PARTY OTHER THAN CONTRACTOR OR ITS AGENT, EMPLOYEE, OR SUBCONTRACTOR OF ANY TIER, EXCEPT THAT CONTRACTOR SHALL INDEMNIFY, HOLD HARMLESS AND DEFEND THE INDEMNIFIED PARTIES AGAINST ANY CLAIMS FOR THE BODILY INJURY OR DEATH OF AN EMPLOYEE OF CONTRACTOR, ITS AGENTS, OR IT SUBCONTRACTORS OF ANY TIER.

§3.18.2 INDEMNITY – EMPLOYEE <u>PERSONAL INJURY CLAIMS</u>. TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR SHALL INDEMNIFY, DEFEND, AND HOLD HARMLESS THE INDEMNIFIED PARTIES AND SHALL ASSUME ENTIRE RESPONSIBILITY AND LIABILITY (OTHER THAN AS A RESULT OF AN INDEMNIFIED PARTY'S GROSS NEGLIGENCE) FOR ANY CLAIM OR ACTION BASED ON OR ARISING OUT OF THE PERSONAL INJURY, INCLUDING THE DEATH, OF ANY EMPLOYEE OF THE CONTRACTOR, SUBCONTRACTORS, OR ANY SUB-SUBCONTRACTOR, OR OF ANY OTHER ENTITY FOR WHOSE ACTS THEY MAY BE LIABLE, WHICH OCCURRED OR WAS ALLEGED TO HAVE OCCURRED ON THE PROJECT SITE OR IN CONNECTION WITH THE PERFORMANCE OF THE WORK OF THIS AGREEMENT. CONTRACTOR HEREBY INDEMNIFIES THE INDEMNIFIED PARTIES EVEN TO THE EXTENT THAT SUCH PERSONAL INJURY WAS CAUSED OR ALLEGED TO HAVE BEEN CAUSED BY THE COMPARATIVE OR CONCURRENT NEGLIGENCE OF THE STRICT LIABILITY OF ANY INDEMNIFIED PARTY. THIS INDEMNIFICATION SHALL NOT BE LIMITED TO DAMAGES, COMPENSATION, OR BENEFITS PAYABLE UNDER INSURANCE POLICIES, WORKERS COMPENSATION ACTS, DISABILITY BENEFITS ACTS, OR OTHER EMPLOYEES BENEFIT ACTS.

§3.18.3 THE CONTRACTOR'S INDEMNITY OBLIGATIONS UNDER THIS SECTION 3.18 SHALL ALSO SPECIFICALLY INCLUDE, WITHOUT LIMITATION, ALL FINES, PENALTIES, DAMAGES, LIABILITY, COSTS, EXPENSES (INCLUDING, WITHOUT LIMITATION, REASONABLE ATTORNEYS' FEES) ARISING OUT OF, OR IN CONNECTION WITH, ANY (I) VIOLATION OF OR FAILURE TO COMPLY WITH ANY LAW, STATUTE, ORDINANCE, RULE, REGULATION, CODE OR REQUIREMENT OF A PUBLIC AUTHORITY THAT BEARS UPON THE PERFORMANCE OF THE WORK BY THE CONTRACTOR, A SUBCONTRACTOR, OR ANY PERSON OR ENTITY FOR WHOM EITHER IS RESPONSIBLE, (II) MEANS, METHODS, PROCEDURES, TECHNIQUES, OR SEQUENCES OF EXECUTION OR PERFORMANCE OF THE WORK, AND (III) FAILURE TO SECURE AND PAY FOR PERMITS, FEES, APPROVALS, LICENSES, AND INSPECTIONS AS REQUIRED UNDER THE CONTRACT DOCUMENTS, OR ANY VIOLATION OF ANY PERMIT OR OTHER APPROVAL OF A PUBLIC AUTHORITY APPLICABLE TO THE WORK, BY THE CONTRACTOR, A SUBCONTRACTOR, OR ANY PERSON OR ENTITY FOR WHOM EITHER IS RESPONSIBLE.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 In the event that Owner has not engaged an architect and an architect is not identified in the Agreement, but, rather, engages an engineer for the Project, all references made in these General Conditions to the "Architect" shall mean and include the engineer identified as the "Engineer" in the Agreement and all duties, responsibilities and limitations of authority of the Architect, as set forth in the Contract Documents, shall apply to the Engineer.

§ 4.2 ADMINISTRATION OF THE CONTRACT
§ 4.2.1 The Architect will provide administration of the Contract as described in the Owner-Architect Agreement. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility 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 Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS AND CONTRACT ADMINISTRATION
Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to relate relevant communications between Owner and Architect to the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 If included in Architect's scope of work, the agreement between Owner and Architect, or if requested by the Owner, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts based on the Architect's evaluations of the Contractor's Applications for Payment.

§ 4.2.6 To the extent permitted by the agreement between Owner and Architect, the Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect, in consultation with the Owner, will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Owner to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 To the extent provided in the agreement between Owner and Architect, the Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Owner and Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 If requested by Owner, the Architect will prepare Change Orders and Construction Change Directives with the Owner's prior written consent, but the Architect may authorize minor changes in the Work as provided in the agreement between Owner and Architect, or in Section 7.4 of these General Conditions. If requested by Owner, the Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 If requested by Owner, the Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 If requested by Owner, the Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents, and if approved by Owner.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS

§ 5.2.1 For Construction Manager-At-Risk Agreements. The Construction Manager shall publicly advertise for bids or proposals and receive bids or proposals from trade contractors or Subcontractors for the performance of all major elements of the work other than the minor work that may be included in the general conditions. The Construction Manager may seek to perform portions of the work itself if:

(A) the Construction Manager submits its bid or proposal for those portions of the Work in the same manner as all other trade contractors or Subcontractors; and

(B) the Owner determines that the Construction Manager's bid or proposal provides the best value for the Owner.

§ 5.2.1.1 REVIEW OF BIDS OR PROPOSALS. Construction Manager shall review all trade contractor or Subcontractor bids or proposals in a manner that does not disclose the contents of the bid or proposal during the selection process to a person not employed by the Construction Manger, Architect, Engineer, or Owner. All bids or proposals shall be made available to the Owner on request and to the public after the later of the award of the contract or the seventh day after the date of final selection of bids or proposals. If the Construction Manager reviews, evaluates, and recommends to the Owner a bid or proposal from a trade contractor or subcontractor but the Owner requires another bid or proposal to be accepted, the Owner shall compensate the Construction Manager by a change in the Contract Sum, Contract Time, or Cost of the Work for any additional cost and risk that the Construction manager incurs because of the Owner's requirement that another bid or proposal be accepted.

§ 5.2.2 The Contractor shall not contract with a proposed Subcontractor, person, or entity to whom the Owner has made reasonable objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made a reasonable objection.

§ 5.2.3 If the Owner has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time may be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity previously selected if the Owner makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

§ 5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the

execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.2 All subcontracts shall be in writing and, if requested, Contractor shall provide Owner with copies of executed subcontracts.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 This Contract is for Owner's benefit, its successors and assigns who, as well as Contractor, may directly enforce all rights and warranties, express or implied herein, but Subcontractors shall have recourse only against Contractor and not against Owner. Owner may rely solely upon Contractor for enforcement of all Subcontracts. To effect such purpose, Contractor assigns to Owner all right to bring any actions against subcontractors and material vendors without waiver by Owner of his right against Contractor because of defaults, delays and effects for which a subcontractor or material vendor may also be liable, said assignment being effective only if:

.1 Contractor is in default under the Contract Documents; or

.2 Owner has terminated the Contract in accordance with the Contract Documents; and

.3 Only for those subcontract agreements which the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.4 The assignment is subject to the prior rights of the surety, if any, obligated under any bond relating to the Contract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation may be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

§5.4.4 The Architect and the Owner shall have the right to request from any Subcontractor at any time during the course of construction, a notarized affidavit stating the amount of monies which have been paid to the Subcontractor as of any certain stipulated date.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed

necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect and the Owner apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner, separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Owner or Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work. Except as permitted in Section 7.3 and Section 9.7.2, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that Owner has been unjustly enriched by any alteration of or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any Claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Contractor's Change Order shall set forth in clear and precise detail breakdowns of labor and materials for all trades involved and the estimated impact on the dates of Substantial Completion. Contractor shall furnish supporting data as reasonably requested by Owner.

§ 7.2.3 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the construction schedule.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Owner shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Owner or Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Owner or the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Owner will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Owner determines to be reasonably justified. The Owner's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of Contractor to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK
If permitted in the agreement between Owner and Architect, the Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents.

ARTICLE 8 TIME
§ 8.1 DEFINITIONS
§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION
§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract and are a material element of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance

required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME
§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect and Owner determines may justify delay, then the Contract Time shall be extended by Change Order to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not, was not, or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (i) is not caused, or could not have been anticipated, by the Contractor, and (ii) could not be limited or avoided by the Contractor's timely notice to the Owner of the delay or reasonable likelihood that a delay will occur.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 Notwithstanding anything contained in the Contract Documents to the contrary, the Contractor's sole remedy for any (1) delay in the commencement, prosecution or completion of the Work, (2) hindrance or obstruction in the performance of the Work, (3) loss of productivity, or (4) other similar claims (collectively referred in this Subparagraph 8.3.3 as "Delay or Delays"), whether or not such Delays are foreseeable, shall be an extension of time in which to complete the Work. In no event shall the Contractor be entitled to any other compensation or recovery of any damages, costs, or attorneys' fees, caused by any Delays, unknown site conditions, errors, inconsistencies, or omissions in the Drawings and Specifications, or concealed or unknown conditions, including, without limitation, consequential damages, lost opportunity costs, impact damages or other similar damages; provided however that Contractor may be entitled to additional time as provided under Section 8.3.1.

§ 8.3.4 If the Contractor submits a progress report indicating, or otherwise expresses an intention to achieve, completion of the Work prior to any completion date required by the Contract Documents or expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied.

§ 8.3.5 Owner shall have the right to occupy, without prejudice to rights of either party, any completed or substantially completed portions of the Work, notwithstanding the fact that time for completion of entire Work, or portions thereof, may not be expired. Occupancy and use by Owner shall not constitute, in itself, acceptance of the Work.

ARTICLE 9 PAYMENTS AND COMPLETION
§ 9.1 CONTRACT SUM
The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES
Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Owner and Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Owner may require. This schedule, unless objected to by the Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 As provided in the Agreement and in the Contract Documents, the Contractor shall submit to the Owner and Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Owner or the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 If requested by Owner or required elsewhere in the Contract Documents, Each Application for Payment shall be accompanied by the following, all in a form and substance satisfactory to the Owner:

(i) With each Application for Payment: a current Sworn Statement from the Contractor setting forth all Subcontractors and all material suppliers with whom the Contractor has subcontracted, the amount of each such subcontract, the amount requested for any Subcontractor or material supplier in the Application for Payment, and the amount to be paid to the Contractor from such progress payment;

(ii) With each Application for Payment: a duly executed Conditional Waiver and Release on Progress Payment from the Contractor and Subcontractors establishing receipt of payment or satisfaction of the payment requested by the Contractor in the current Application for Payment;

(iii) Commencing with the second Application for Payment submitted by the Contractor, a duly executed Unconditional Waiver and Release on Progress Payment from Contractor and all Subcontractors, material suppliers and, where appropriate, lower tier subcontractors that have billed more than $5,000 on a single application of payment, establishing receipt of payment or satisfaction of payment of all amounts requested on behalf of such entities and disbursed prior to submittal by the Contractor of the current Application for Payment;

(iv) With the Final Application for Payment: Contractor shall submit a Conditional Waiver and Release on Final Payment as required by Texas Property Code 53.284. Upon receipt of final payment, Contractor shall submit an Unconditional Waiver and Release on Final Payment as required by Texas Property Code 53.284; and

(v) Such other information, documentation, and materials as the Owner, or the title insurer may require in order to ensure that Owner's property is free of lien claims. Such other documents may include, without limitation, original copies of lien or bond claim releases suitable for filing with the County Clerk in Williamson County, Texas.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an

Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, bond claims, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.3.3.1 The Contractor further expressly undertakes to defend Owner, at the Contractor's sole expense, against any actions, lawsuits, or proceedings brought against Owner as a result of liens filed against the Work, the site of any of the Work, the Project site and any improvements thereon, or any portion of the property of any of Owner (referred to collectively as "liens" in this Section 9.3.3), provide the Owner has paid Contractor pursuant to the requirements of the Contract Documents. The Contractor hereby agrees to indemnify and hold Owner harmless against any such liens or claims of lien and agrees to pay any judgment or lien resulting from any such actions, lawsuits, or proceedings.

§ 9.3.3.2 The Owner shall release any payments withheld due to a lien or bond claims if the Contractor obtains security acceptable to the Owner, however, the Contractor shall not be relieved of any responsibilities or obligations under this Section 9.3.3, including, without limitation, the duty to defend and indemnify Owner.

§ 9.3.3.3 Retainage. The Owner shall withhold from each progress payment, as retainage, five percent (5%) of the total earned amount. Retainage so withheld shall be managed in conformance with Subchapter B, Chapter 2252 of the Texas Government Code. Any request for reduction or release of retainage shall be accompanied by written consent of the Contractor's Surety. No such request shall be made until the Contractor has earned at least sixty-five percent (65%) of the total Contract Price.

§ 9.3.3.4 For purposes of Texas Government Code § 2251.021 (a)(2), the date the performance of service is completed is the date when the Owner's representative approves the Application for Payment.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Owner or Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Owner or Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Owner or Architect is unable to certify payment in the amount of the Application, the Owner or Architect will notify the Contractor. If the Contractor and Architect, or Contractor and Owner, as the case may be, cannot agree on a revised

amount, the Architect will promptly issue a Certificate for Payment for the amount that can be certified. The Owner or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Owner or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims;
.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a separate contractor;
.6 failure to maintain the scheduled progress, or reasonable evidence that the Work will not be completed within the Contract Time;
.7 failure to comply with the requirements of Texas Government Code Chapter 2258 (Prevailing Wage Law);
.8 failure to include sufficient documentation to support the amount of payment requested for the Project;
.9 failure to obtain, maintain, or renew insurance coverage, payment/performance bonds or warranty bond required by the Contract Documents; or
.10 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 The Owner shall make payment in the manner and within the time provided in the Contract Documents and in accordance with Chapter 2251 of the Texas Government Code.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than 10 days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.4 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2.

§ 9.6.5 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.7 FAILURE OF PAYMENT

§ 9.7.1 If the Architect is required to issue Certificates for Payment and, through no fault of the Contractor, the Architect fails to timely issue Certificates for Payment in the time permitted in the Contract Documents, or if the Owner does not pay the Contractor by the date established in the Contract Documents, then the Contractor may, upon twenty-one days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received.

§ 9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to (i) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (ii) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Owner and Architect a comprehensive list of items to be completed or corrected prior to final payment (punch list). Failure to include an item on the punch list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's punch list, the Owner and Architect will examine the Work to determine whether the Work or designated portion thereof is substantially complete. If the Owner and/or Architect's examination discloses any item, whether or not included on the Contractor's punch list, that is not sufficiently complete in accordance with the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Owner or Architect. In such case, the Contractor shall then submit a request for another examination by the Owner or Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect, if required by the Contract Documents, or Owner will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Unless otherwise provided, Contractor shall complete all items on the punch list within 30 days of Substantial Completion. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5, the surety, and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare

and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld.

§ 9.9.2 Immediately prior to partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Owner and Architect will make such inspection and, when the Owner and Architect find the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties and guarantees required under or pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Architect as part of the final Application for Payment. The final Certificate for Payment will not be issued by the Architect until all warranties and guarantees have been received and accepted by the Owner.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner and Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work have been paid or otherwise satisfied, within the period of time required by Chapter 2251 of the Texas Government Code, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety to final payment, (5) a warranty bond in a form acceptable to Owner, and (6) other data establishing payment or satisfaction of obligations, such as receipts, unconditional full and final releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner.

§ 9.10.3 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 Claims, security interests or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents; or
.3 terms of warranties required by the Contract Documents.

§ 9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss. Notwithstanding any language to the contrary, the Owner shall not have any responsibility for job site inspections or safety recommendations. Any inspections or observations by the Owner or the Architect are solely for the benefit of the Owner and shall not create any duties or obligations to anyone else.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all covering and fully protect the Work, as necessary, from injury or damage by any cause.

§ 10.2.10 The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work that cause death, personal injury, or property damage.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written notice from the Owner.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are expressly required by the Contract Documents. The Owner shall be responsible for materials or substances expressly required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site or negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time, if any, claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations, which coverage shall be maintained for no less than four (4) years following final payment; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Agreement or the Contract Documents. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Unless otherwise provided, copies of the insurance policies, in form acceptable to the Owner, shall provided to Owner within 30 days of Owner's request. Except as otherwise provided, all of the policies provided shall name Owner as an additional insured, and such policies shall immediately deliver to Owner copies of all such insurance policies, together with certificates by the insurer evidencing Owner's coverage there under. Each policy of insurance obtained by Contractor pursuant to the Contract Documents shall provide, by endorsement or otherwise (i) that such policy shall not be canceled, endorsed, altered or reissued to effect a change in coverage for any reason or to any extent whatsoever unless the insurer shall have first given Owner and Lender at least thirty (30) days prior written notice thereof, and (ii) that Owner may, but shall not be obligated to, make premium payments to prevent the cancellation, endorsement, alteration or reissuance of such policy and such payments shall be accepted by the insurer to prevent the same. Such policies shall provide, by endorsement or otherwise, that Contractor shall be solely responsible for the payment of all premiums under the policies, and that Owner shall have no obligation for the payment thereof, notwithstanding that Owner is named as additional insured under the policy. Any insured loss or claim of loss shall be adjusted to the Owner, and any settlement payments shall be made payable to the Owner as a trustee for the insureds, as their interests may appear. Upon the occurrence of an insured loss or claim of loss, monies received will be held by Owner who shall make distribution in accordance with an agreement to be reached in such event between Owner and Contractor. If the parties are unable to agree between themselves on the settlement of the loss, such dispute shall be resolved in accordance with section 15, below, but the Work of the Project shall nevertheless progress during any such period of dispute without prejudice to the rights of any party to the dispute. The Contractor shall be responsible for any loss within the deductible area of the policy. If Owner is damaged by the failure of Contractor to purchase or maintain such insurance, then Contractor shall bear all costs properly attributable thereto. The Contractor shall affect and maintain similar property insurance on portions of the Work stored off the site or in transit when such portions of the Work are to be included. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until Final Completion of the Project.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE
The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE
§ 11.3.1 Unless otherwise provided in the Contract Documents, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section

11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an “all-risk” or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect’s and Contractor’s services and expenses required as a result of such insured loss as well as coverage for building materials while in transit or building materials suitably stored at a temporary location. Property insurance provided by the Contractor shall not cover any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, and other similar items commonly referred to as construction equipment that may be on the site and the capital value of which is not included in the Work. The Contractor shall make its own arrangements for any insurance it may require on such construction equipment. Any such policy obtained by the Contractor under this Section 11.3.1 shall include a waiver of subrogation in accordance with the requirements of Section 11.3.4.

§ 11.3.1.2 If the Contractor does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Contractor shall so inform the Owner in writing prior to commencement of the Work. If the Owner is damaged by the failure or neglect of the Contractor to purchase or maintain insurance as described above, without so notifying the Owner in writing, then the Contractor shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 Contractor shall be responsible for any deductibles to the extent that the loss arose out of or was cause by Contractor’s negligence or breach of the Agreement.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.4 WAIVERS OF SUBROGATION
The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect’s consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent of actual recovery of any insurance proceeds under any property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance. However, this waiver shall not apply to property insurance purchased by Owner after completion of the Work or Final Payment, whichever comes first. The Owner or Contractor, as appropriate, shall require of the Architect, Architect’s consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.5 A loss insured under the property insurance shall be adjusted in good faith and made payable to the Owner in good faith for the insureds, as their interests may appear. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate

agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.4 BONDS
§ 11.4.1 The Contractor is required to tender to Owner, prior to commencing the Work, performance and payment bonds, as required by law. In the event Contractor fails to provide such bonds within the time provided by the Agreement, Owner may immediately, upon notice of such failure, or within a reasonable time thereafter, at its sole option and discretion: (1) void this Agreement in its entirety; or (2) procure such bonds on behalf of the Contractor, deducting such amounts from the Contract Price. In the event Owner voids the Agreement under this section, Contractor may forfeit its bid bond.

§ 11.4.2 A Performance Bond is required if the Contract Price is in excess of $50,000. The performance bond is solely for the protection of the Owner, in the full amount of the Contract Price and conditioned on the faithful performance of the Work in accordance with the Contract Documents. The form of the bond shall be approved by the Owner.

§ 11.4.3 A Payment Bond is required if the Contract Price is in excess of $25,000. A payment bond is payable to the Owner, in the full amount of the Contract Price and solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the Contractor or a supplier of required materials or labor. The form of bond shall be approved by the Owner.

§ 11.4.4 Warranty Bond. Upon Substantial Completion and prior to final completion and final payment, Contractor shall provide Owner with a Warranty Bond in the sum of 10% of the Contact Price or 10% of the Guaranteed Maximum Price for Construction Manager-At-Risk Agreements for the entire warranty period set out in the Contract Documents. The form of bond shall be approved by the Owner.

§ 11.4.5 Corporate sureties authorized to issue bonds shall be qualified and comply with relevant provisions of the Texas Insurance Code.

§ 11.4.6 Each bond shall be executed by a corporate surety or sureties authorized to do business in the State of Texas and acceptable to the Owner. If any bond is for more than 10 percent of the surety's capital and surplus, the Owner may require certification that the company has reinsured the excess portion with one or more reinsurers authorized, accredited, or trusteed to do business in the State. A reinsurer may not reinsure for more than 10 percent of its capital and surplus. If a surety upon a bond loses its authority to do business in the State, the Contractor shall within thirty (30) days after such loss furnish a replacement bond at no added cost to the Owner.

§ 11.4.7 Each bond shall be accompanied by a valid Power-of-Attorney (issued by the surety company and attached, signed and sealed with the corporate embosses seal, to the bond) authorizing the attorney in fact who signs the bond to commit the company to the terms of the bond, and stating any limit in the amount for which the attorney can issue a single bond.

§ 11.4.8 The process of requiring and accepting bonds and making claims thereunder shall be conducted in compliance with Chapter 2253, Texas Government Code. If for any reason a statutory payment or performance bond is not honored by the surety, the Contractor shall fully indemnify and hold the Owner harmless of and from any costs, losses, obligations or liabilities it incurs as a result.

§ 11.4.9 Owner shall furnish certified copies of a payment bond and the related Agreement between Owner and Contractor to any qualified person seeking copies who complies with §2253.026, Texas Government Code.

§ 11.4.10 Claims on Payment Bonds. Claims on payment bonds must be sent directly to the Contractor and its surety in accordance with § 2253.041, Texas Government Code. All Payment Bond claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or its surety. The

Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such responsibility because of any representation by any agent or employee.

§ 11.4.11 Payment Claims when Payment Bond not Required. When the value of the Agreement between Owner and the Contractor is less than $25,000.00, claimants and their rights are governed by Texas Property Code, §§ 53.231 – 53.239. These provisions set out the requirements for filing a valid lien on funds unpaid to the Contractor as of the time of filing the claim, actions necessary to release the lien and satisfaction of such claims.

§11.4.12 Sureties shall be listed on the Department of the Treasury's Listing of Approved Sureties stating companies holding Certificates of Authority as acceptable sureties on Federal Bonds and acceptable reinsuring companies (Department Circular 570).

§ 11.5 GENERAL REQUIREMENTS
§ 11.5.1 Unless otherwise provided in the Contract Documents, all insurance coverage procured by the Contractor shall be provided by insurance companies having policy holder ratings no lower than "A" and financial ratings not lower than "XII" in the Best's Insurance Guide, the latest edition in effect as of the date of the Contract, and subsequently in effect at the time of renewal of any policies required by the Contract Documents.

§ 11.5.2 If the Owner is damaged by failure of the Contractor to purchase or maintain insurance required under Article 11, then the Contractor shall bear all reasonable costs (including attorneys' fees and court and settlement expenses) properly attributable thereto.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK
§ 12.1 UNCOVERING OF WORK
§ 12.1.1 If a portion of the Work is covered contrary to the Owner or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Owner or Architect, be uncovered for examination and be replaced at the Contractor's expense without change in the Contract Time. If prior to the date of Substantial Completion the Contractor, a Subcontractor, or anyone for whom either is responsible uses or damages any portion of the Work (other than start-up), including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

§ 12.1.2 If a portion of the Work has been covered that the Owner or Architect has not specifically requested to examine prior to its being covered, the Owner or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK
§ 12.2.1 The Contractor shall promptly correct Work rejected by the Owner or Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION
§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner

to do so. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may, without prejudice to any other remedies, correct it in accordance with Section 2.4 or file a claim with the surety of any applicable warranty bond.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK
If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS
§ 13.1 GOVERNING LAW
The Contract shall be governed by the law of Williamson County, Texas.

§ 13.2 SUCCESSORS AND ASSIGNS
§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in the Contract Documents or by law, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.3 WRITTEN NOTICE
Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES
§ 13.4.1 Except as expressly provided in the Contract Documents, duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority. The Contractor shall give the Owner and Architect timely notice of when and where tests and inspections are to be made so that the Owner and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Owner and Architect of when and where tests and inspections are to be made so that the Owner and Architect may be present for such procedures.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense. The Contractor also agrees the cost of testing services related to remedial operations performed to correct deficiencies in the Work, shall be borne by the Contractor.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Owner and Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

The rate of interest that accrues on an overdue payment is the rate in effect on September 1 of the fiscal year in which the payment becomes overdue. The rate in effect on September 1 is equal to the sum of:
(1) one percent; and
(2) the prime rate as published in the Wall Street Journal on the first day of July of the preceding fiscal year that does not fall on a Saturday or Sunday pursuant to §2251.025 of the Texas Government Code.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the time limits provided by law. Nothing herein shall be construed as shortening the period of time Owner has for commencing claims to less than what is required by law.

§ 13.8 Application To Subcontracts

Any specific requirement in this Contract that the responsibilities or obligations of Contractor also apply to a Subcontractor is added for emphasis and are also hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of Contractor's responsibilities or obligations shall not be construed to diminish, abrogate or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.

§ 13.10 GENERAL PROVISIONS

§ 13.10.1 All personal pronouns used in this Contract, whether used in the masculine, feminine, or neuter gender, shall include all other genders; and the singular shall included the plural and vice versa. Titles of articles, sections, and subsections are for convenience only and neither limit nor amplify the provisions of this Contract. The use herein of the word "including," when following any general statement, term, or matter, shall not be construed to limit such statement, term, or matter to the specific items or matters set forth immediately following such word or to similar items or matters, whether or not non-limiting language (such words as "without limitation," or "but not limited to," or words of similar import) is used with reference thereto, but rather shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement, term, or matter.

§ 13.10.2 Wherever possible, each provision of this Agreement shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of this Agreement, or portion thereof, is prohibited by law or found invalid under any law, only such provision or portion thereof shall be ineffective, without in any manner invalidating or affecting the remaining provisions of this Agreement or valid portions of such provision, which are hereby deemed servable.

§ 13.11 NO ORAL WAIVER

The Provisions of the Contract Documents shall not be changed, amended, waived, or otherwise modified in any respect except by a writing signed by Owner. No person is authorized on behalf of Owner to orally change, amend, waive, or otherwise modify the terms of the Contract Documents or any of the Contractor's duties or obligations under or arising out of the Contract Documents. Any change, waiver, approval, or consent granted to the Contractor shall be limited to the specific matters stated in the writing signed by Owner, and shall not relieve Contractor of any other of the duties and obligations under the Contract Documents. No "constructive" changes shall be allowed.

§ 13.12 Texas Public Information Act. To the extent, if any, that any provision in the Contract Documents is in conflict with Tex. Gov't Code 552.001 et seq., as amended (the "Public Information Act"), the same shall be of no force or effect. Furthermore, it is expressly understood and agreed that Owner, its officers and employees may request advice, decisions and opinions of the Attorney General of the State of Texas in regard to the application of the Public Information Act to any information or data furnished to Owner whether or not the same are available to the public. It is further understood that Owner, its officers and employees shall have the right to rely on the advice, decisions and opinions of the Attorney General, and that Owner, its officers and employees shall have no liability or obligation to Contractor for the disclosure to the public, or to any person or persons, of any software or a part thereof, or other items or data furnished to Owner by Contractor in reliance of any advice, decision or opinion of the Attorney General of the State of Texas.

§ 13.13 Equal Opportunity in Employment. The Contractor agrees that during the performance of the Agreement it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Parties will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; termination; rates of pay or other forms of compensation, and selection for training, including apprenticeship.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 90 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped; or

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on an undisputed Certificate for Payment within the time stated in the Contract Documents.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon 30 days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 fails to commence the Work in accordance with the provisions of this Contract,

.2 fails to prosecute the Work to completion thereof in a diligent, efficient, timely, workmanlike, skillful and careful manner and in strict accordance with the provisions of the Contract,

.3 fails to use an adequate amount or quality of personnel or equipment to complete the Work without undue delay,

.4 fails to perform any of its obligations under the Contract,

.5 fails to make prompt payments when due to its Subcontractors and Suppliers, or as required by Texas Government Code 2251,

.6 files any petition or other pleading seeking any relief under any provisions of the Federal Bankruptcy Act, as amended, or any other federal or state statute or law providing for reorganization of debts or other relief from creditors, permits a receiver or other person to be appointed on account of its insolvency or financial condition, or becomes insolvent,

.7 creates any situation or state of facts which would authorize or permit an involuntary petition in bankruptcy to be filed against Contractor, or

.8 has not met or in Owner's opinion will not meet the dates of Substantial Completion set forth in the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, in its sole and absolute discretion, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, 30 days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. In the event that a final decision under section 15, below, is rendered that sufficient cause did not exist for termination under this section 14.2, then the termination shall be considered a termination for convenience, under section 14.4, below.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages and costs incurred by the Owner in finishing the Work and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 Upon such termination, the Contractor shall recover the amounts provided in Section 10.1.3 of the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims for events arising during the performance of the Work by Contractor must be initiated by written notice to the other party with a copy sent to the Architect; provided, however, that the claimant shall use its best efforts to furnish the other party, as expeditiously as possible, with notice of any Claim including, without limitation, those in connection with concealed or unknown conditions, once such claim is recognized, and shall take steps to mitigate the alleged or potential damages, delay, or other adverse consequences arising out of the condition that is the cause of such a Claim. Claims by Contractor must be initiated within 10 business days after occurrence of the event giving rise to such Claim or within 10 business days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims may also be reserved in writing within the time limits set forth in this Section 15.1.2. Any notice of Claim or reservation of Claim must clearly identify the alleged cause and the nature of the Claim and include data and information available to the claimant that will facilitate prompt verification and evaluation of the Claim.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE
Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the Contract Documents.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST
If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME
§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.3 MEDIATION
§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived shall be subject to mediation as a condition precedent to seeking redress in a court of competent jurisdiction.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation, which shall consist of a single mediator who is knowledgeable about the subject matter of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in Williamson County, Texas. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§15.3.4 All disputes not resolved through mediation shall be decided in litigation in Williamson County, Texas.

§ 15.3.5 No waiver of Immunity. Nothing in the Contract Documents shall be deemed to waive, modify or amend any legal defense available at law or in equity to Owner, its past or present officers, employees, or agents, nor to create any legal rights or claim on behalf of any third party. Owner does not waive, modify, or alter to any extent whatsoever the availability of the defense of governmental immunity under the laws of the State of Texas and of the United States.

Question and Answers for Bid #1906-328 - Server Room at Williamson County Justice Center

Overall Bid Questions
There are no questions associated with this bid.