Solicitation 1902-299

Williamson County Expo Center East Concession and Restrooms

Bid Designation: Public

Williamson County, Texas

Bid 1902-299
Williamson County Expo Center East Concession and Restrooms

Bid Number	1902-299
Bid Title	Williamson County Expo Center East Concession and Restrooms
Expected Expenditure	**$700,000.00** (This price is expected - not guaranteed)
Bid Start Date	In Held
Bid End Date	Mar 21, 2019 3:00:00 PM CDT
Question & Answer End Date	Mar 15, 2019 3:00:00 PM CDT
Bid Contact	Blake Skiles Senior Purchasing Specialist 512-**943**-1478 blake.skiles@wilco.org
Contract Duration	**180 days**
Contract Renewal	Not Applicable
Prices Good for	**365 days**
Pre-Bid Conference	**Mar 14, 2019 9:00:00 AM CDT** **Attendance is mandatory** **Location: Williamson County Expo Center** **5350 Bill Pickett Trail** **Taylor, TX 76574**
Bid Comments	**Williamson County is seeking a qualified supplier to construct an east side concession area and restrooms at the Williamson County Expo Center located in Taylor Texas.**

Item Response Form

Item	**1902-299--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	**1902-299--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

PUBLIC ANNOUNCEMENT AND GENERAL INFORMATION

WILLIAMSON COUNTY PURCHASING DEPARTMENT
SOLICITATION NUMBER 1902-299
Williamson County Expo Center East Concession and Restrooms

PROPOSALS MUST BE RECEIVED ON OR BEFORE:
Mar 21, 2019 3:00:00 PM CDT

PROPOSALS WILL BE PUBLICLY OPENED:
Mar 21, 2019 3:00:00 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.

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 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 RFP.

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 RFP 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.

- Price – 40 Point
- Respondent's Experience and Reputation – 30 Points
- Respondent's Proposed Personnel for the Project – 20 Points
- Respondent's Office Location – 10 Points

1.3.5 Interviews

Interview scoring (if applicable) will be provided along with invitation to interview candidates. Best and Final Offer will be required from all Respondents scheduled for interviews, twenty-four (24) hours prior to scheduled interview.

1.3.6 Additional Evaluation Information

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

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

Randy Bell, Senior Director of Parks and Recreation (or successor), Williamson County, 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 Initial Contract Term

This is a one time purchase with no options to renew.

1.6 Contract Extensions

If applicable, at the end of the Initial Contract Term, the Commissioners Court reserves the right to extend the Initial Contract Term, by mutual agreement of both parties, as it deems to be in the best interest of the County. The extension may be negotiated if renewal indications are provided within the County's timeframe which reflect renewal terms for the forthcoming policy year that are deemed by the County to be competitive with current market conditions. However, the County may terminate the contract at any time if funds are restricted, withdrawn, not approved, or if service is unsatisfactory. Any extension will be in twelve (12) month increments for up to an additional twenty-four (24) months, with the terms and conditions remaining the same. The total period of the contract, including all extensions will not exceed a maximum combined period of sixty (60) months. The extension of the contract is contingent on the appropriation of necessary funds by the Commissioners Court for the fiscal year in question. Upon the failure of the Commissioners Court to so appropriate in any year, the Respondent may elect to terminate the contract, with no additional liability to the County. The County and the Respondent agree that termination shall be the Respondent's sole remedy under this circumstance.

1.7 Insurance Requirements

By signing its Bid, the Respondent agrees to maintain at all times during any term of the Contract and any ensuing Agreement at Respondent 's cost, insurance in accordance with this provision. Respondent 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 and should include the RFP number and description:

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 Respondent and County.

Successful Respondent must comply with the following insurance requirements at all times during this Contract:

A. Coverage Limits. Except as specified otherwise in the Contract and any ensuing Agreement(s), Successful Respondent, at Successful Respondent's sole cost, shall purchase and maintain during the entire term while the Contract and any ensuing Agreement(s)is in effect the following insurance:

1. Worker's Compensation in accordance with statutory requirements.
2. Commercial General Liability Insurance with a combined minimum Bodily Injury and Property Damage limits of $1,000,000.00 per occurrence and $2,000,000.00 in the aggregate.
3. Automobile Liability Insurance for all owned, non-owned, and hired vehicles with combined minimum limits for Bodily Injury and Property Damage limits of $500,000.00 per occurrence and $1,000,000.00 in the aggregate.
4. Professional Liability Errors and Omissions Insurance in the amount of $2,000,000.00 per claim.

B. Additional Insureds; Waiver of Subrogation. County, its directors, officers and employees shall be added as additional insureds under policies listed under (2) and (3) above, and on those policies where County, its directors, officers and employees are additional insureds, such insurance shall be primary and any insurance maintained by County shall be excess and not contribute with it. Such policies shall also include waivers of subrogation in favor of County.

C. Premiums and Deductible. Successful Respondent shall be responsible for payment of premiums for all of the insurance coverages required under this section. Successful Respondent further agrees that for each claim, suit or action made against insurance provided hereunder, with respect to all matters for which the Successful Respondent is responsible, Successful Respondent shall be solely responsible for all deductibles and self-insured retentions. Except as specified otherwise in the Contract and any ensuing Agreement(s), any deductibles or self-insured retentions **over $50,000** in the Successful Respondent's insurance must be declared and approved in writing by County in advance.

D. Commencement of Work. Successful Respondent shall not commence any field work under this Contract until he/she/it has obtained all required insurance and such insurance has been approved by County. As further set out below, Successful Respondent shall not allow any subcontractor/subconsultant(s) to commence work to be performed in connection with this Contract until all required insurance has been obtained and approved and such approval shall not be unreasonably withheld. Approval of the insurance by County shall not relieve or decrease the liability of Successful Respondent hereunder.

E. Insurance Company Rating. The required insurance must be written by a company approved to do business in the State or 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.

F. Certification of Coverage. Successful Respondent shall furnish County with a certification of coverage issued by the insurer. Successful Respondent shall not cause any insurance to be canceled nor permit any insurance to lapse. **In addition to any other notification requires set forth hereunder, Successful Respondent shall also notify County, within twenty-four (24) hours of receipt, of any notices of expiration, cancellation, non-renewal, or material change in coverage it receives from its insurer.**

G. No Arbitration. It is the intention of the County and agreed to and hereby acknowledged by the Successful Respondent, that no provision of this Contract shall be construed to require the County to submit to mandatory arbitration 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 or as may be required by law or a court of law with jurisdiction over the provisions of this Contract.

H. Subcontractor/Subconsultant's Insurance. Without limiting any of the other obligations or liabilities of Successful Respondent, Successful Respondent shall require each subcontractor/subconsultant performing work under the Contractor and any ensuing Agreement(s) (to the extent a subcontractor/subconsultant is allowed by County) to maintain during the term of the Contract and any ensuing Agreement(s), at the subcontractor/subconsultant's own expense, the same stipulated minimum insurance required in this section above, including the required provisions and additional policy conditions as shown below in this section.

Successful Respondent shall obtain and monitor the certificates of insurance from each subcontractor/subconsultant in order to assure compliance with the insurance requirements. Successful Respondent must retain the certificates of insurance for the duration of the Contract and any ensuing Agreement(s), and shall have the responsibility of enforcing these insurance requirements among its subcontractor/subconsultants. County shall be entitled, upon request and without expense, to receive copies of these certificates of insurance.

I. Insurance Policy Endorsements. Each insurance policy shall include the following conditions by endorsement to the policy:

1. County shall be notified thirty (30) days prior to the expiration, cancellation, non-renewal or any material change in coverage, and such notice thereof shall be given to County by certified mail to:

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

2. The policy clause “Other Insurance” shall not apply to any insurance coverage currently held by County, to any such future coverage, or to County’s Self-Insured Retentions of whatever nature.

J. Cost of Insurance. The cost of all insurance required herein to be secured and maintained by Successful Respondent shall be borne solely by Successful Respondent, with certificates of insurance evidencing such minimum coverage in force to be filed with County.

WILLIAMSON COUNTY EXPO CENTER EAST CONCESSION & RESTROOMS

January 11, 2019

SPECIFICATIONS

ARCHITECT OF RECORD
POPULOUS
4800 Main St, Suite 300
Kansas City, MO 64112, USA
Phone: 816-221-1500

CIVIL ENGINEER ARCHITECT
HALFF & ASSOCIATES
9500 Amberglen Blvd., Building F, Suite 125
Austin, TX 78729
Phone: 512-777-4600

STRUCTURAL
KINGS E360
2851 Joe DiMaggio Blvd., Suite 22
Round Rock, TX 78665
Phone: 512-244-1966

MEP/ FIRE PROTECTION CONSULTANTS
HENDRIX CONSULTING ENGINEERS
115 East Main Street
Round Rock, TX 78644
Phone: 512-218-0060

POPULOUS®
DRAWING PEOPLE TOGETHER

SPECIFICATIONS GROUP Issue Date Latest Issue

FACILITY CONSTRUCTION SUBGROUP

DIVISION 00 – PROCUREMENT & CONTRACTING REQ.

00 01 07	PROFESSIONAL STAMPS	

DIVISION 01 – GENERAL REQUIREMENTS

01 25 00	SUBSTITUTION PROCEDURES	1/11/2019
01 25 01	FORM - SUBSTITUTION	1/11/2019
01 31 00	PROJECT MANAGEMENT AND COORDINATION	1/11/2019
01 31 01	FORM – ELECTRONIC DATA TRANSFER AGREEMENT	1/11/2019
01 31 02	FORM - RFI	1/11/2019
01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION	1/11/2019
01 33 00	SUBMITTAL PROCEDURES	1/11/2019
01 33 01	FORM – SUBMITTAL TRANSMITTAL	1/11/2019
01 42 00	REFERENCES	1/11/2019
01 60 00	PRODUCT REQUIREMENTS	1/11/2019
01 73 00	EXECUTION	1/11/2019
01 77 00	CLOSEOUT PROCEDURES	1/11/2019
01 78 23	OPERATION AND MAINTENANCE DATA	1/11/2019
01 78 39	PROJECT RECORD DOCUMENTS	1/11/2019

DIVISION 02 – EXISTING CONDITIONS

02 41 19	SELECTIVE DEMOLITION	1/11/2019

DIVISION 03 – CONCRETE

03 11 00	CONCRETE FORMING	1/11/2019
03 20 00	CONCRETE REINFORCING	1/11/2019
03 30 00	CAST-IN-PLACE CONCRETE	1/11/2019
03 35 00	CONCRETE FINISHING	1/11/2019
03 39 00	CONCRETE CURING	1/11/2019

DIVISION 04 – MASONRY

04 05 13	MASONRY MORTARING	1/11/2019
04 20 00	UNIT MASONRY	1/11/2019
04 22 10	REINFORCED CONCRETE UNIT MASONRY	1/11/2019

DIVISION 05 – METALS

05 12 00	STRUCTURAL STEEL FRAMING	1/11/2019
05 20 00	METAL JOISTS	1/11/2019
05 31 23	STEEL DECKING	1/11/2019
05 50 00	METAL FABRICATIONS	1/11/2019

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

06 10 53	MISCELLANEOUS ROUGH CARPENTRY	1/11/2019

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 21 00	THERMAL INSULATION	1/11/2019
07 46 46	FIBER-CEMENT SIDING	1/11/2019
07 54 23	THERMOPLASTIC POLYOLEFIN (TPO) ROOFING	1/11/2019
07 71 00	ROOF SPECIALTIES	1/11/2019
07 72 00	ROOF ACCESSORIES	1/11/2019

07 72 60	PERSONAL FALL ARREST SYSTEM	1/11/2019
07 84 43	JOINT FIRESTOPPING	1/11/2019
07 92 00	JOINT SEALANTS	1/11/2019
	DIVISION 08 – OPENINGS	
08 11 13	HOLLOW METAL DOORS AND FRAMES	1/11/2019
08 33 23	OVERHEAD COILING DOORS	1/11/2019
	DIVISION 09 – FINISHES	
09 21 16	GYPSUM BOARD ASSEMBLIES	1/11/2019
09 21 16.23	GYPSUM BOARD SHAFT WALL ASSEMBLIES	1/11/2019
09 51 13	ACOUSTICAL PANEL CEILINGS	1/11/2019
09 61 13	FLOOR SEALERS	1/11/2019
09 65 13	RESILIENT BASE AND ACCESSORIES	1/11/2019
09 91 23	INTERIOR PAINTING	1/11/2019
	DIVISION 10 – SPECIALTIES	
10 14 00	SIGNAGE	1/11/2019
10 28 00	TOILET, BATH AND LAUNDRY ACCESSORIES	1/11/2019
10 44 16	FIRE EXTINGUISHERS	1/11/2019
	DIVISION 20 – MEP GENERAL PROVISIONS	
20 00 00	GENERAL PROVISIONS	1/11/2019
20 01 00	BASIC MATERIALS AND METHODS	1/11/2019
20 07 00	INSULATION	1/11/2019
	DIVISION 22 – PLUMBING	
22 01 00	INSIDE UTILITY TRENCH EXCAVATION, BACKFILL AND COMPACTION	1/11/2019
22 02 00	OUTSIDE UTILITY TRENCH EXCAVATION, BACKFILL AND COMPACTION	1/11/2019
22 11 16	WATER DISTRIBUTION SYSTEM	1/11/2019
22 11 17	WATER HEATERS	1/11/2019
22 13 16	LIQUID WASTE TRANSFER	1/11/2019
22 30 00	PLUMBING FIXTURES AND TRIM	1/11/2019
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23 05 93	BALANCING AND TESTING	1/11/2019
23 09 00	CONTROLS (NATIVE BACNET)	1/11/2019
23 11 26	FUEL GAS SYSTEM (LP)	1/11/2019
23 30 00	AIR DISTRIBUTION	1/11/2019
23 30 01	SPECIAL DUCT SYSTEMS	1/11/2019
	DIVISION 26 – ELECTRICAL	
26 05 00	GENERAL	1/11/2019
26 05 10	SCHEDULE OF VALUES	1/11/2019
26 05 19	WIRE & CABLE	1/11/2019
26 05 26	GROUNDING & BONDING	1/11/2019
26 05 29	HANGER & SUPPORTING DEVICES	1/11/2019
26 05 33	RACEWAYS	1/11/2019
26 05 34	OUTLET BOXES, PULL BOXES, AND JUNCTION BOXES	1/11/2019
26 05 80	EMPTY RACEWAY ROUGH-IN	1/11/2019
26 22 13	HIGH EFFICIENCY K-7 (DOE 2016) TRANSFORMERS	1/11/2019
26 24 16	BRANCH CIRCUIT PANELBOARDS	1/11/2019

26 27 26	DEVICES.....	1/11/2019
26 28 15	SAFETY DISCONNECT SWITCH.....	1/11/2019
26 28 16	FUSES.....	1/11/2019
26 28 26	CONTACTORS.....	1/11/2019
26 43 00	SURGE PROTECTIVE DEVICES.....	1/11/2019
26 51 00	INTERIOR LIGHTING SYSTEM.....	1/11/2019
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27 00 00	GENERAL TECHNOLOGY REQUIREMENTS.....	1/11/2019
27 40 00	AV-MULTIMEDIA GENERAL REQUIREMENTS.....	1/11/2019
27 41 50	MULTIMEDIA SYSTEMS.....	1/11/2019
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31 00 00	CIVIL STANDARD SPECIFICATIONS	1/11/2019
31 05 00	STRUCTURAL EARTHWORK FOR BUILDING FOUNDATION	1/11/2019
31 23 23.15	COMPACTION CONTROL & TESTING FOR BUILDING FOUNDATION	1/11/2019
	DIVISION 32 – EXTERIOR IMPROVEMENTS	
32 84 00	IRRIGATION SYSTEM	1/11/2019
32 93 00	PLANTING	1/11/2019

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SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
1. Section 01 21 00 "Allowances" for products selected under an allowance.
2. Section 01 23 00 "Alternates" for products selected under an alternate.
3. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

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 three copies 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 cannot be provided, if applicable.
    b. Coordination 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 substitution 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 and 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 substitution 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.

PART 2 - PRODUCTS

2.1 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 3 - EXECUTION (Not Used)

END OF SECTION

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POPULOUS

REQUEST FOR SUBSTITUTION

No: _____

PROJECT: **Williamson County Concession and Restroom** Populous Project Number: 14.3903.00		**CONTRACTOR:** Phone: Fax:			
Substitution Request By:		Firm:			
Transmittal Record	**Attn:**	**Firm:**	**Date Sent:**	**Date Rec'd:**	**Date Due:**
Subcontractor to Contractor					
Contractor to Populous					
Populous to Consultant					
Consultant to Populous					
Populous to Contractor					
Contractor to Subcontractor					

Product, Material, or Equipment Required of the Contract Documents:
Specification Section: Drawing No./Detail:
Description:
Requested Substitute Product, Material, or Equipment:
Description:
Attachments Included: _____ Drawings _____ Product Data _____ Samples _____ Test Reports _____ Other _____ Research and Evaluation Reports
Reason for Substitution:
Describe similar installations and applications and identify responsible parties:

SAMPLE

4800 Main St., Suite 300 T +1 816 221 1500 info@populous.com
Kansas City, MO 64112, USA F +1 816 221 1578 populous.com

PROJECT: Williamson County Concession and Restroom	**REQUEST FOR SUBSTITUTION No._____**

Compare significant qualities of size, weight, durability, performance, and visual effect.

Describe changes required in other elements of the Work to accommodate the proposed substitution, including work performed by the Owner and separate contractors:

Describe the impact the proposed substitution will have on the work schedule in comparison to the work schedule without approval of the proposed substitution:

Proposed Change to Contract Time:_____

Define cost impact of the proposed substitution in relation to the originally specified item, including related modifications required to other Work:

Proposed Change to Contract Price:_____

Contractor's Certification and Waiver:

Permission to make any substitution after Award of Contract shall be effected by Change Order. Change Order shall not relieve the Contractor, any subcontractor, or manufacturer, fabricator, or supplier from the responsibility for any deficiency that may exist in the substituted product or any departures or deviations from the Contract Documents as modified by such Change Order. Except as otherwise expressly specified by the Contractor in the Request for Substitution and expressly approved in such Change Order, the Contractor warrants that the proposed substitution satisfies all standards and requirements established by the original product, material or equipment specified and the Change Order shall not be deemed to modify the Contract Documents with respect thereto. If any substitution will affect a correlated function, adjacent construction, or the work of other trades or contractors, the necessary changes and modifications to the affected work shall be considered as an essential part of the proposed substitution, to be accomplished by the Contractor without additional expense to the Owner if and when accepted.

Contractor's Signature:_____ Date:_____

Architect's Action:

ACCEPTED:

Architect's Signature:_____ Date:_____

MORE INFORMATION REQUIRED:_____

Architect's Signature:_____ Date:_____

REJECTED:_____

Architect's Signature:_____ Date:_____

4800 Main St., Suite 300 T +1 816 221 1500 info@populous.com
Kansas City, MO 64112, USA F +1 816 221 1578 populous.com

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. Requests for Information (RFIs).
   4. Project Web site.
   5. Project meetings.

B. Related Requirements:
   1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking interpretation 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, and telephone number 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 telephone numbers, including home, office, 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, on Project Web site, and by each temporary telephone. 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.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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.

D. Conservation: Coordinate construction activities to ensure that operations are carried out 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.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown 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 the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate 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 Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of

visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

C. 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 Portable Data File (PDF) format.
3. 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. Digital Data Software Program: Architectural Drawings are available in Auotdesk Revit version 2013. AutoCad can be produce by special request.
    c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
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: Form bound in Project Manual, or software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in Adobe Acrobat 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 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 10 days 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.

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. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT WEB SITE

A. Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Photo documentation.
8. Schedule and calendar management.
9. Submittals forms and logs.
10. Payment application forms.
11. Drawing and specification document hosting, viewing, and updating.
12. Online document collaboration.
13. Reminder and tracking functions.
14. Archiving functions.

B. Provide up to seven Project Web site user licenses for use of the Owner, Architect, and Architect's consultants. Provide four hours of software training at via web host for Project Web site users.

C. On completion of Project, provide one complete archive copy of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.

D. Provide Project Web site software packages under their current published licensing agreements.
1. Construction Manager’s standard software.

E. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

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.
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: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. 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.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Critical work sequencing and long-lead items.
      c. Designation of key personnel and their duties.
      d. Lines of communications.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for testing and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. Preparation of record documents.
      l. Use of the premises.
      m. Work restrictions.
      n. Working hours.
      o. Owner's occupancy requirements.
      p. Responsibility for temporary facilities and controls.
      q. Procedures for moisture and mold control.
      r. Procedures for disruptions and shutdowns.
      s. Construction waste management and recycling.
      t. Parking availability.
      u. Office, work, and storage areas.
      v. Equipment deliveries and priorities.
      w. First aid.
      x. Security.
      y. Progress cleaning.
   4. 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 that requires 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. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. 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 biweekly 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 utilization.
        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.

F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each contractor 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 utilization.
    9) Temporary facilities and controls.
    10) Work hours.
    11) Hazards and risks.
    12) Progress cleaning.
    13) Quality and work standards.
    14) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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Electronic Data Transfer Agreement

This Agreement is entered into and agreed by, between and among Populous and its consultants on the project (Populous), _____ ***(name of Owner)*** (Owner) and _____ ***(name of, Contractor, Construction Manager, Subcontractor or Vendor, as applicable)*** (Recipient(s)) and is made in reference to the _____ (the Project).

In consideration of the request of _____ ***(name of Owner, Contractor, Construction Manager, Subcontractor or Vendor)*** to Populous to deliver to Recipient(s) certain Electronic Data for use on the Project, the parties mutually agree as follows:

Electronic Data includes but is not limited to, Digital Model Files, 3D building model (Revit) files, computer-aided design (CAD) files including native file formats (DWG) and drawing exchange formats (DXF), files. The Electronic Data is being provided in its original format produced by Populous. The specific Electronic Data and formats to be transferred are as follows:

(List if stand-alone document; not required if under the terms of an agreement that covers distribution of electronic media in general.)

The means by which the Electronic Data is transferred may include but are not limited to, electronic mail, File Transfer Protocol (FTP) sites and disc copies transmitted between the parties in this Agreement. Owner and Recipient(s) acknowledge that Electronic Data transferred in any manner or translated from the system and format used by Populous to an alternate system or format is subject to errors that may affect the accuracy and reliability of the data and that the data may be altered, whether inadvertently or otherwise. **ACCORDINGLY, POPULOUS MAKES NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY OF THE INFORMATION TRANSFERRED. THE ELECTRONIC DATA ARE NOT THE CONSTRUCTION DOCUMENTS AND DIFFERENCES MAY EXIST BETWEEN THESE ELECTRONIC FILES AND CORRESPONDING HARD-COPY CONSTRUCTION DOCUMENTS AND ACTUAL CONSTRUCTION. RECIPIENT UNDERSTANDS AND ACKNOWLEDGES THE INFORMATION PROVIDED IS FOR REFERENCE ONLY, AND RECIPIENT WILL VERIFY THE DRAWINGS WITH EXISTING SITE CONDITIONS. POPULOUS RESERVES THE RIGHT TO RETAIN HARD COPY ORIGINALS IN ADDITION TO ELECTRONIC COPIES OF THE ELECTRONIC DATA TRANSFERRED, WHICH ORIGINALS SHALL BE REFERRED TO AND SHALL GOVERN.**

As consideration to Populous for the transfer of the Electronic Data, Owner and Recipient(s) agree that Populous shall not be liable for and hereby waive all claims and agree to indemnify and hold Populous harmless from all liabilities, losses, damages or expenses (including attorneys' fees) arising out of, or connected with: (1) the transfer of Electronic Data by any means; or (2) the use, modification or misuse by parties other than Populous of the Electronic Data; or (3) the limited life expectancy and decline of accuracy or readability of the Electronic Data due to storage; (4) any use of the Electronic Data by any third parties receiving the data from other parties to this Agreement; or (5) the incompatibility of software or hardware used by Populous and the other parties to this Agreement; or (6) viruses.

The Electronic Data provided by Populous under the terms of this Agreement are the proprietary information of Populous. All Electronic Data is to be treated as confidential and is not to be disclosed to or shared with others without Populous' express, written consent.

Populous shall be compensated by_____ ***(name of Owner, Consultant, Contractor, Construction Manager, Subcontractor or Vendor, as applicable)*** and upon receipt of payment in full shall transmit the Electronic Data to the appropriate parties in this Agreement. Compensation shall be a Lump-Sum Fee of Two Hundred and Fifty Dollars ($250.00) for the transfer of Electronic Data. Reimbursable Expenses shall be paid in full and are in addition to the Lump-Sum Fee. ***(Insert special fee and reimbursable arrangements not covered above)***

The parties have executed this Agreement as of the dates stated below.

OWNER	**POPULOUS**
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____
[RECIPIENT]	**[RECIPIENT]**
Company: _____	Company: _____
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____
[RECIPIENT]	**[RECIPIENT]**
Company: _____	Company: _____
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____

(Delete the Signature blocks that do not apply)

SAMPLE

POPULOUS

REQUEST FOR INFORMATION

No: _____

PROJECT: Williamson County Concession and Restroom Populous Project Number: 14.3903.00	**CONTRACTOR:** Phone: Fax:

RFI Transmittal Record	Attn:	Date Sent	Date Received	Date Due
Contractor to CM				
[**Contractor**][**CM**] to Populous				
Populous to Consultant				
Consultant to Populous				
Populous to [**Contractor**][**CM**]				
CM to Contractor				

QUESTION:	**Question By:**		
Drawing Reference:		**Specification Reference:**	
RESPONSE:	**By:**	**Firm:**	**Date:**

_____ **RFI can be answered by Contractor's review of Contract Documents.**

_____ **This response is a clarification or an interpretation of the Contract Documents. No change in the Contract Sum or Contract Time is authorized.**

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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. Startup construction schedule.
   2. Contractor's construction schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports.
   5. Material location reports.
   6. Site condition reports.
   7. Special reports.

B. Related Requirements:
   1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
   2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

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 the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of 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 electronic file.

B. Startup construction schedule.
   1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.
   4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at monthly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

A. 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, 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, list of subcontracts, 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.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. 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.

B. Activities: Treat each story 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 10 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.
      a. Structural steel components.
      b. Custom railings.
      c. Custom flooring and wall finishes.
      d. Pre-engineered metal buildings.
   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. 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.
   6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. 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. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   4. Products Ordered in Advance: 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.
   5. 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.
   6. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.

c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

7. 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.

D. 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.

E. 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.

F. 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 Contract Time.

G. 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, and equipment required achieving compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for commencement of the Work. 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.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
   1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for commencement of the Work.
      a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
   2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
   3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
   4. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
   1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
      a. Preparation and processing of submittals.
      b. Mobilization and demobilization.
      c. Purchase of materials.
      d. Delivery.
      e. Fabrication.
      f. Utility interruptions.
      g. Installation.
      h. Work by Owner that may affect or be affected by Contractor's activities.
      i. Testing.
      j. Punch list and final completion.
      k. Activities occurring following final completion.
   2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
    a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediately preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 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. Accidents.
   8. Meetings and significant decisions.
   9. Unusual events (see special reports).
   10. Stoppages, delays, shortages, and losses.
   11. Meter readings and similar recordings.
   12. Emergency procedures.
   13. Orders and requests of authorities having jurisdiction.
   14. Change Orders received and implemented.
   15. Construction Change Directives received and implemented.
   16. Services connected and disconnected.
   17. Equipment or system tests and startups.
   18. Partial completions and occupancies.
   19. Substantial Completions authorized.

B. Material Location Reports: At weekly 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.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: 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, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the 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.

B. 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.

C. 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.

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
   1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   3. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

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."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule 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 date of fabrication.
h. Scheduled dates for purchasing.
i. Scheduled dates for installation.
j. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

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 different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   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 required, allow 21 days for initial review of each submittal.
5. Failure of the contractor to conform to his Submittal Schedule waives to Architect’s responsibility to confirm to the above Processing Time requirements.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:
   a. Project name.
   b. Date.

c. Name and address of Architect.
d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. 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.

H. 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.

I. 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.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
    a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.

d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
6. 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.

E. 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.
   5. Submit product schedule in the following format:
      a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

L. 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.

M. 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.

N. 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.

O. 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.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. 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.

S. 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.

T. 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:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

U. 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.

V. 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.

W. 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.

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads.

Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Approved: The Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents.
   2. Approved as Noted: The Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal, and the requirements of the Contract Documents.
   3. Approved as Noted / Resubmit: The Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal, and the requirements of the Contract Documents. Make corrections submittal according to the notations and resubmit for record.
   4. Revise / Resubmit: Do not proceed with Work covered by the submittal. Revise or prepare a new submittal according to the notations. Repeat if necessary to obtain different action mark.
   5. Rejected: Do not proceed with Work covered by the submittal. The Work covered by the submittal does not conform to the Contract Documents. Prepare a new submittal. Repeat if necessary to obtain different action mark.

6. No Action Taken or Required: For Informational Submittals that are packaged with Action Submittals, and do not require action.
7. Not Required for Review: Portion of submittal was not required of the Contract Documents, and therefore was not reviewed by Architect.

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. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

POPULOUS

SUBMITTAL TRANSMITTAL

No: _____

PROJECT: **Williamson County Concession and Restroom** Populous Project Number: 14.3903.00	**CONTRACTOR:** Phone: Fax:

Transmittal Record	Attn:	Date Sent	Date Rec'd	Quantity		
				Prints	Mfg. Lit.	Samples
Contractor to CM						
CM to Populous						
Populous to Consultant						
Consultant to Populous						
Populous to CM						
CM to Contractor						

Action Taken

A = Approved
AN = Approved as Noted
AN/R = Approved as Noted / Resubmit
RR = Revise and Resubmit
REJ = Rejected
NARR = No Action Taken or Required
NRR = Not Required for Review

A	AN	AN/R	RR	REJ	NARR	NRR	Spec or Dwg. No.	Date	Deviations from Contract Docs.	Description

Contractor Remarks:	Architect Remarks:

NOTE: Notations do not authorize changes to Contract Sum or Contract Times. Submittal has been reviewed for Architectural design conformity and general conformance to Contract Documents only. Contractor shall confirm and correlate dimensions at Project Site for tolerances, clearances, quantities, fabrication processes, techniques of construction, coordination of Work, and full compliance with Contract Documents. Acceptance of Submittal does not constitute acceptance of undocumented deviations.

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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 in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. AABC - Associated Air Balance Council; www.aabc.com.
   2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.

3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.

50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; www.ec-central.org.
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Approval Services; (See CSA).
96. ICBO - International Conference of Building Officials; (See ICC).
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
100. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101. IEC - International Electrotechnical Commission; www.iec.ch.

102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
104. IESNA - Illuminating Engineering Society of North America; (See IES).
105. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
106. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
107. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
108. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
113. ISO - International Organization for Standardization; www.iso.org.
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union; www.itu.int/home.
116. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; www.lightning.org.
119. MBMA - Metal Building Manufacturers Association; www.mbma.com.
120. MCA - Metal Construction Association; www.metalconstruction.org.
121. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
122. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
123. MHIA - Material Handling Industry of America; www.mhia.org.
124. MIA - Marble Institute of America; www.marble-institute.com.
125. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
126. MPI - Master Painters Institute; www.paintinfo.com.
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
128. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
129. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
130. NADCA - National Air Duct Cleaners Association; www.nadca.com.
131. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
132. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
133. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
134. NCMA - National Concrete Masonry Association; www.ncma.org.
135. NEBB - National Environmental Balancing Bureau; www.nebb.org.
136. NECA - National Electrical Contractors Association; www.necanet.org.
137. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
138. NEMA - National Electrical Manufacturers Association; www.nema.org.
139. NETA - InterNational Electrical Testing Association; www.netaworld.org.
140. NFHS - National Federation of State High School Associations; www.nfhs.org.
141. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; www.nfrc.org.
144. NHLA - National Hardwood Lumber Association; www.nhla.com.
145. NLGA - National Lumber Grades Authority; www.nlga.org.
146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
148. NRCA - National Roofing Contractors Association; www.nrca.net.
149. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
150. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.

151. NSPE - National Society of Professional Engineers; www.nspe.org.
152. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
154. NWFA - National Wood Flooring Association; www.nwfa.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; www.redwoodinspection.com.
161. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; www.siaonline.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
178. STI - Steel Tank Institute; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
184. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
185. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
186. TMS - The Masonry Society; www.masonrysociety.org.
187. TPI - Truss Plate Institute; www.tpinst.org.
188. TPI - Turfgrass Producers International; www.turfgrasssod.org.
189. TRI - Tile Roofing Institute; www.tileroofing.org.
190. UBC - Uniform Building Code; (See ICC).
191. UL - Underwriters Laboratories Inc.; www.ul.com.
192. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
193. USAV - USA Volleyball; www.usavolleyball.org.
194. USGBC - U.S. Green Building Council; www.usgbc.org.
195. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
196. WASTEC - Waste Equipment Technology Association; www.wastec.org.
197. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
198. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association; www.wdma.com.

200. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
201. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
202. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
203. WPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.

c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS - California Department of Health Services; (See CDPH).
4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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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.

B. Related Requirements:
1. Section 01 21 00 "Allowances" for products selected under an allowance.
2. Section 01 23 00 "Alternates" for products selected under an alternate.
3. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
4. Section 01 42 00 "References" for applicable industry standards for products specified.

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 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 specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify 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 one week 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 Approval: 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.

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 not in conflict with 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. 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.
2. 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.
3. Products:
   a. Restricted List: 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 not be considered unless otherwise indicated.
   b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
   a. Restricted List: 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 not be considered unless otherwise indicated.
   b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. 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.

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: 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 the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   5. Samples, if requested.

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.

B. Related Requirements:
   1. Section 01 10 00 "Summary" for limits on use of Project site.
   2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
   3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 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. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
   3. Products: List products to be used for patching and firms or entities that will perform patching work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
      a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit two copies signed by land surveyor.

F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 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.

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, mechanical and electrical systems, 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. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. 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.

D. 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 in occupied spaces and 90 inches 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: Do not use tools or equipment that produce harmful 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 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. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 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.

3.7 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.
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.

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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 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."

3.9 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

PART 1 - GENERAL

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.

B. Related Requirements:
   1. Section 01 73 00 "Execution" for progress cleaning of Project site.
   2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   4. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

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 10 days 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, final completion construction photographic documentation, 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 where applicable.
    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 test/adjust/balance 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 10 days 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 heat and other utilities.
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, including touchup painting.
10. Touch up 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 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 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. Reinspection: 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.

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. Reinspection: 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. MS Excel electronic file. Architect will return annotated file.
   b. PDF electronic file. Architect will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

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 neither planted nor 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.
   1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
p. Clean light fixtures, 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.

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

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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.
   2. Emergency manuals.
   3. Operation manuals for systems, subsystems, and equipment.
   4. Product maintenance manuals.
   5. Systems and equipment maintenance manuals.

B. Related Requirements:
   1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and 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. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed 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 operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.
   2. One paper copy. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return the copy.

C. 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.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. 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.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

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."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: 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. Name and contact information for Commissioning Authority.
   8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   9. 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. 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: Enable bookmarking of 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.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

B. 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.

C. 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.

D. 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.

2.4 OPERATION MANUALS

A. 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.

B. 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.

C. 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.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. 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.

B. 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.

C. 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.

D. 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.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. 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.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. 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 warranty and bond information, as described below.

B. 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.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   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.

D. 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.

E. 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.

F. 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.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. 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 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. 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.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
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.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, 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.
1. 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.

F. 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 operation and maintenance manuals.

2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."

G. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

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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.

B. Related Requirements:
   1. Section 01 73 00 "Execution" for final property survey.
   2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
   3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set(s) of marked-up record 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.

PART 2 - PRODUCTS

2.1 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 archive 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 below first floor.
   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: Annotated PDF electronic file with comment function enabled.
   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 one set of digital data files of the Contract Drawings for use in recording information.
      a. See Section 01 33 00 "Submittal Procedures" 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 and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Format: Annotated PDF electronic file with comment function enabled.
   3. 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.
   4. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.2 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.

2.3 RECORD PRODUCT DATA

A. 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.

B. 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.

2.4 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.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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. Maintenance of Record Documents and Samples: Store record documents and Samples 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.

END OF SECTION

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SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:
1. Section 01 10 00 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 73 00 "Execution" for cutting and patching procedures.
3. Section 01 35 16 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
4. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

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. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

D. 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 [**building manager's**] [**and**] [**other tenants'**] 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. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building 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.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
1. <**Insert warranted system**>.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE 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 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 Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or video, and templates.
   1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
   2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Verify items designated to remain is tagged or identified.

C. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
      f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
      g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: 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.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Protect bench marks, survey control points, and existing structures from damage or displacement.

C. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

D. Remove temporary barricades and protections where hazards no longer exist.

3.5 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. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least <**Insert number**> hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."

B. 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.

C. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site off-site designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. 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 reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section <**Insert Section number and title**> for new roofing requirements.
   1. Remove existing roof membrane, flashings, copings, and roof accessories.
   2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."
   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.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.8 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.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. See Sheet D1-1.

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SECTION 03 11 00 - CONCRETE FORMING

PART 1 - GENERAL
1 WORK INCLUDED
A. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
B. Openings for other affected work.
C. Form accessories.
D. Stripping forms.
2 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS
A. Section 05 50 00 - Metal Fabrication: Metal fabrications attached to formwork.
3 RELATED WORK
A. Section 03 20 00 - Concrete Reinforcement.
B. Section 03 30 00 - Cast-In-Place Concrete.
4 REFERENCES
A. ACI 301 - Specifications for Structural Concrete for Buildings.
B. ACI 347 - Recommended Practice for Concrete Formwork.
C. PS 1 - Construction and Industrial Plywood.
5 SYSTEM DESCRIPTION
A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.
6 QUALITY ASSURANCE
A. Construct and erect concrete formwork in accordance with ACI 301.
7 REGULATORY REQUIREMENTS
A. Conform to applicable codes for Taylor, Texas.
8 SUBMITTALS
A. Submit shop drawings under provisions of Section 01 33 00
B. Indicate pertinent dimensions, materials, and arrangement of joints and ties.
C. Submit product data under provisions of Section 01 33 00.
9 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, and handle materials under provisions of Section 01 61 00.
B. Deliver form materials in manufacturer's packaging with installation instructions.
C. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

PART 2 - PRODUCTS
1 FORM MATERIALS
A. Plywood: Douglas Fir species; solid one exterior side grade; sound, undamaged sheets with straight edges.
B. Lumber: SYP species; #2 grade; with grade stamp clearly visible.
C. Pan Type: Steel type: removable; of size and profile required.
2 FORMWORK ACCESSORIES
A. Form Ties: Snap-off metal of fixed length; cone type; 1 inch break back dimension; free of defects that will leave holes no larger than one inch diameter in concrete surface.
B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
C. Fillets for Chamfered Corners: Wood strips type; 3/4 x 3/4 inch size; maximum possible lengths.
D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION
1 INSPECTION
A. Verify lines, levels, and measurements before proceeding with formwork.

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2 PREPARATION
- A. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.
- B. Arrange and assemble formwork to permit dismantling, stripping, so that concrete is not damaged during its removal.
- C. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3 ERECTION
- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- B. Camber slabs and beams to achieve ACI 301 tolerances.
- C. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- D. Provide chamfer strips on external corners of all exposed concrete.
- E. Construct formwork to maintain tolerances in accordance with ACI 301.

4 APPLICATION OF FORM RELEASE AGENT
- A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
- B. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes or applied coverings which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

5 INSERTS, EMBEDDED PARTS, AND OPENINGS
- A. Provide formed openings where required for work embedded in or passing through concrete.
- B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

6 FORM REMOVAL
- A. Notify Architect/Engineer prior to removing formwork.
- B. Do not damage concrete surfaces during form removal.
- C. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.
- D. Do not remove forms and shoring until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. Remove load supporting forms when concrete has attained 75 percent of required 28 day compressive strength, provided construction is reshored.

7 CLEANING
- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean-out ports.
- C. During cold weather, remove ice and snow from forms. Do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

END OF SECTION

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SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 GENERAL
1 WORK INCLUDED
A. Reinforcing steel bars, for cast-in-place concrete.
B. Support chairs, bolsters, bar supports, and spacers, for supporting reinforcement.
2 RELATED WORK
A. Section 03 11 00 - Concrete Formwork.
B. Section 03 30 00 - Cast-In-Place Concrete: Concrete placement and vapor barrier.
3 REFERENCES
A. ACI 301 - Specifications for Structural Concrete for Buildings.
B. ACI 315 - Details and Detailing of Concrete Reinforcement.
C. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.
D. ANSI/AWS D1.4 - Structural Welding Code Reinforcing Steel.
E. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
F. CRSI - Manual of Practice.
G. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
H. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.
4 QUALITY ASSURANCE
A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice, and Documents 63 and 65.
B. Conform to ACI 301.
5 FIELD SAMPLES
A. Provide reinforcement for field sample specified in Sections 03 11 00 and 03 30 00.
6 SHOP DRAWINGS
A. Submit shop drawings under provisions of Section 01 3300.
B. Indicate sizes, spacing, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.
7 CERTIFICATES
A. Submit mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis.

PART 2 PRODUCTS
1 MATERIALS
A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet-steel deformed bars, uncoated finish.
2 ACCESSORY MATERIALS
A. Tie Wire: Minimum 16 gage annealed type, or acceptable patented system.
B. Metal Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete including load bearing pad on bottom to prevent vapor barrier puncture. Supports to be spaced a maximum of 4'-0" on center each way.
3 FABRICATION
A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03 30 00.
B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 EXECUTION
1 INSTALLATION
A. Before placing concrete, clean reinforcement of foreign particles or coatings.
B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

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C. Do not displace or damage vapor barrier required by Section 03 30 00.

END OF SECTION

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL
1 WORK INCLUDED
A. Cast-in-place concrete foundation footings.
B. Cast-in place concrete tilt up panels
C. Floors and slabs on fill on vapor barrier.
D. Concrete fill in Reinforced Unit Masonry.
2 RELATED WORK
A. Section 03 11 00 - Concrete Formwork.
B. Section 03 20 00 - Concrete Reinforcement.
C. Section 03 39 00 - Concrete Curing.
3 REFERENCES
A. ACI 301 - Specifications for Structural Concrete for Buildings.
B. ASTM C33 - Concrete Aggregates.
C. ASTM C94 - Ready-Mixed Concrete.
D. ASTM C150 - Portland Cement.
E. ASTM C260 - Air-Entraining Admixtures for Concrete.
F. ASTM C494 - Chemical Admixtures for Concrete.
4 QUALITY ASSURANCE
A. Perform work in accordance with ACI 301.
B. Obtain materials from same source throughout the Work.
5 REGULATORY REQUIREMENTS
A. Conform to applicable codes for Taylor, Texas.
6 FIELD SAMPLES
A. Cast field sample in formwork specified in Section 03 10 00 under provisions of Section 01 33 00.
B. Use specified concrete.
C. Obtain acceptance of surface finish.
D. Maintain sample panel exposed to view for duration of concrete work. Remove when directed.
7 TESTS
A. Testing and analysis of concrete will be performed under provisions of Section 01 4000.
B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.
C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
D. Tests of cement and aggregates will be performed to ensure conformance with requirements stated herein.
E. Three concrete test cylinders will be taken for every 75 or less cu yds of each class of concrete placed each day.
F. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
G. One slump test will be taken for each set of test cylinders taken.
8 PRODUCT DATA
A. Submit product data under provisions Section 01 33 00.
B. Provide product data for specified products.
C. Submit manufacturers' instructions under provisions of Section 01 33 00.
PART 2 PRODUCTS
1 CONCRETE MATERIALS
A. Cement: ASTM C150, normal - Type I Portland type; grey color.
B. Fine and Coarse Aggregates: ASTM C33.

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C. Water: Clean, potable, and not detrimental to concrete.

2 ADMIXTURES
- A. Air Entrainment: ASTM C260.
- B. Chemical Admixture: ASTM C494, Type A - water reducing.

3 ACCESSORIES
- A. Vapor Barrier:
  - 1.Vapor Barrier must have the following qualities
    - a. WVTR less than or equal to 0.006 gr/ft^2/hr as tested by ASTM E 96
    - b. ASTM E 1745 Class A (Plastics)
  - 2.Vaport Barrier Products
    - a. Stego Wrap (15-mil) Vapor Barrier by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com
- B. Vapor Retarding Seam Tape
  - 1.Tape must have the following qualities:
    - a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower
- C. Vapor Proofing Mastic
  - 1.Mastic must have the following qualities:
    - a. Water Vaport Transmission Rate ASTME 96 0.3 perms or lower
- D. Pipe Boots
  - 1. Construct piper boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instruction.
- E. Non-shrink Grout: Premixed compound consisting of non- metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5000 psi in 28 days.
- F. Substitutions: Under provisions of Section 01 60 00.

4 CONCRETE MIX
- A. Mix concrete in accordance with ASTM C94.
- B. Provide concrete of the characteristics noted on Drawings
- C. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.
- D. Use set-retarding admixtures during hot weather only when approved by Architect/Engineer.
- E. Add air entraining agent to concrete mix for concrete work subject to freeze-thaw cycling.
- F. No water shall be added to concrete at the site without consent of the testing lab.
- G. The use of Fly-Ash is permitted, up to a maximum of 20% of dry cement content by weight.

PART 3 EXECUTION

1 INSPECTION
- A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

2 PREPARATION
- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions.
- B. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and set with Hilti HIT HY150 Adhesive or approved equal.
- C. Install vapor barrier under interior slabs on fill. Lap joints minimum 6 inches tape and seal. Do not disturb or damage vapor barrier while placing concrete. Repair damaged vapor barrier.

3 PLACING CONCRETE

A. Notify Architect/Engineer minimum 36 hours prior to commencement of concreting operations.
B. Place concrete in accordance with ACI 301.
C. Hot Weather Placement: ACI 305.
D. Cold Weather Placement: ACI 306.
E. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
F. Maintain concrete cover around reinforcing as follows:

Walls (Exposed to Weather or Backfill)	2 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Fill	1 1/2 inch

G. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
H. Place floor slabs on fill in checkerboard pattern.
I. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

4 FINISHING
A. Provide concrete surfaces to be left exposed with smooth rubbed finish.
B. Provide Class A tolerances to floor slabs according to ACI 301.
C. Pitch to drains as shown on plans.

5 PATCHING
A. Notify Architect/Engineer immediately upon removal of forms.
B. Patch imperfections.

6 DEFECTIVE CONCRETE
A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.
B. Repair or replace concrete not properly placed or not of the specified type and/or compressive strength, at no expense to owner.

7 FIELD QUALITY CONTROL
A. Field inspection and testing will be performed under provisions of Section 01 4000.
B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

8 PROTECTION
A. Protect finished work under provisions of Section 01 7300.
B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

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SECTION 03 3500
CONCRETE FINISHING

PART 1 GENERAL
- 1 WORK INCLUDED
  - A. Sealer.
- 2 RELATED WORK
  - A. Section 03 30 00 - Cast-In-Place Concrete: Prepared concrete surfaces ready for finishing.
  - B. Section 03 39 00 - Concrete Curing.
- 3 REFERENCES
  - A. ACI 301 - Specifications for Structural Concrete for Buildings.
  - B. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- 4 QUALITY ASSURANCE
  - A. Applicator: Company specializing in concrete floor surface finishing with 3 years experience and approved by compound hardener coating manufacturer.
  - B. Furnish concrete sealer and curing compound in manufacturer's packaging with application instructions.
- 5 FIELD SAMPLES
  - A. Provide field sample under provisions of Section 01 33 00.
  - B. Prepare trial finish in area designated by Architect/Engineer.
- 6 PRODUCT DATA
  - A. Submit product data under provisions of Section 01 33 00.
  - B. Provide product data for specified products.
  - C. Submit manufacturers' instructions under provisions of Section 01 33 00.

PART 2 PRODUCTS
- 1 ACCEPTABLE MANUFACTURERS
  - A. Master Builders - MasterSeal
  - B. L & M Construction Chemicals – Dress & Seal
  - C. Substitutions: Under provisions of Section 00 46 00.
- 2 MATERIALS
  - A. Curing Compound: ASTM C309; clear.
  - B. Bonding Agent: Two component modified epoxy resin.

PART 3 EXECUTION
- 1 INSPECTION
  - A. Verify floor surfaces are acceptable for application of this work.
  - B. Ensure floor surfaces are depressed to accommodate finish materials.
  - C. Beginning of installation means acceptance of surfaces.
- 2 PREPARATION
  - A. Apply bonding agent prior to application of finish in accordance with manufacturer's instructions.
- 3 FLOOR FINISHING
  - A. Finish concrete floor surfaces in accordance with ACI 301.
  - B. Uniformly spread, screed, and float concrete. Do not use grate tampers or mesh rollers. Do not spread concrete by vibration.
  - C. Steel trowel surfaces to receive carpeting or resilient flooring.
  - D. Hard Steel trowel surfaces which will be left exposed.
- 4 TOLERANCES
  - A. Maintain surface flatness with maximum variation of 1/8 inch in 10 feet.
  - B. In areas of floor drains, maintain floor level at walls and slope surface uniformly to drains at 1/8 inch per foot or as indicated.
- 5 CURING
  - A. Cure finish floor surfaces in accordance with ACI 301.

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B. Apply curing compound on finished floor surfaces. Apply in accordance with manufacturer's instructions.

6 TREATMENT

A. Apply sealer on floor surfaces where concrete will be left exposed. Apply in accordance with manufacturer's instruction.

END OF SECTION

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SECTION 03 39 00 - CONCRETE CURING

PART 1 GENERAL

1 WORK INCLUDED

A. Concrete curing materials and methods.

B. Surfaces of concrete not finished with sealer as specified in 03 39 00.

2 RELATED WORK

A. Section 03 33 00 - Cast-In-Place Concrete.

B. Section 03 35 00 - Concrete Finishing.

3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

C. ASTM D2103 - Polyethylene Film and Sheeting.

D. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

4 QUALITY ASSURANCE

A. Conform to requirements of ACI 301.

5 PRODUCT DATA

A. Submit product data under provisions of Section 01 33 00.

B. Provide product data for specified products.

C. Submit manufacturers' installation instructions under provisions of Section 01 33 00.

6 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature at 70 degrees F for three days.

PART 2 PRODUCTS

1 MATERIALS

A. Water: Clean and not detrimental to concrete.

B. Membrane Curing Compound: ASTM C30

2 ACCEPTABLE PRODUCTS

A. Master Builders: MasterSeal

B. L&M Construction Chemicals: Surfaseal

C. Eculid Chemicals: Kurez DR VOX

D. Substitutions: Under provisions of Section 00 46 00.

PART 3 EXECUTION

1 INSPECTION

A. Verify concrete surfaces are ready for curing.

2 MEMBRANE CURING COMPOUND

A. Apply curing compound in two coats with second coat at right angles to first.

B. Apply in accordance with manufacturers' instructions.

END OF SECTION

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SECTION 04 0513 – MORTAR

PART 1 GENERAL

1 WORK INCLUDED

A. Mortar for unit masonry.

2 RELATED WORK

A. Section 01 40 00- Quality Control: Testing laboratory services.
B. Section 04 22 10 - Reinforced Masonry System.

3 REFERENCES

A. ASTM C5 - Quicklime for Structural Purposes.
B. ASTM C91 - Masonry Cement.
C. ASTM C94 - Ready-Mixed Concrete.
D. ASTM C144 - Aggregate for Masonry Mortar.
E. ASTM C150 - Portland Cement.
F. ASTM C207 - Hydrated Lime for Masonry Purposes.
G. ASTM C270 - Mortar for Unit Masonry.
H. ASTM C387 - Packaged, Dry, Combined Materials for Mortar and Concrete.
I. ASTM C476 - Grout for Reinforced and Non-reinforced Masonry.
J. ASTM C780 – Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
K. International Masonry Industry All-Weather Council (IMIAC) -Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

4 MIX TESTS

A. Test mortar mix cubes under provisions of Section 01 40 00.
B. Test grout mix cylinders under provisions of Section 01 40 00.

5 SUBMITTALS

A. Submit product data under provisions of Section 00 46 00.
B. Include design mix, environmental conditions, and admixture limitations.
C. Submit manufacturer's installation instructions under provisions of Section 00 46 00.

6 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F (10 degrees C) prior to, during, and 48 hours after completion of masonry work.
B. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

PART 2 PRODUCTS

1 MATERIALS

A. Portland Cement: ASTM C150, normal-Type I; gray color.
B. Masonry Cement: ASTM C98, for general use.
C. Mortar Aggregate: ASTM C144, standard masonry type; clean, dry, protected against dampness, freezing, and foreign matter.
D. Grout Course Aggregate: Maximum 3/8 inch size.
E. Grout Fine Aggregate: sand.
F. Hydrated Lime: ASTM C207, Type S.
G. Quicklime: ASTM C5, non-hydraulic type.
H. Premix Mortar: ASTM C387, using gray cement.
I. Water: Clean and potable.

2 MIXES

A. Mortar for Load Bearing Walls and Partitions: ASTM C270, Type S.
B. Mortar for Non-load Bearing Walls and Partitions: ASTM C270, Type N.
C. Mortar for Reinforced Masonry: ASTM C476, Type S.
D. Pointing Mortar: ASTM C270, Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.

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E. Mortar shall have a compressive strength of 1800 psi under field conditions and as installed in the Work.

3 GROUT FILL

A. Bond Beams: Lintels: Type and strength specified in Section 03 30 00 with a slump of 6 inches.
B. Engineered Masonry: 3000 psi strength at 28 days; 6 inches slump; premixed type in accordance with ASTM C94.

4 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
B. Do not use anti-freeze compounds to lower the freezing point of mortar or grout.
C. If water is lost by evaporation, retemper within two hours of mixing. Do not retemper mortar after two hours of mixing.

PART 3 EXECUTIONS

1 INSTALLATION

A. After inspection of concrete grout spaces by Architect/Engineer, plug cleanout holes with masonry units. Brace against wet grout pressure.
B. Work grout into cores and cavities to eliminate voids.
C. Do not displace reinforcing steel when placing grout.
D. Clean concrete grout spaces of excess mortar and debris.

END OF SECTION

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SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Concrete masonry units
2. Decorative concrete masonry units.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Masonry-cell insulation.

B. Related Sections:
1. Section 03 30 00 "Cast-in-Place Concrete" for dovetail slots for masonry anchors.
2. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 05 50 00 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
4. Section 07 19 00 "Water Repellents" for water repellents applied to unit masonry.
5. Section 07 62 00 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
6. Section 32 32 23 "Segmental Retaining Walls" for dry-laid, concrete unit retaining walls.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 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 Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
5. Prism Test: For each type of construction required, according to ASTM C 1314.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
4. Shop drawings showing control and expansion joint locations, reinforcing, and detailing.

C. Samples for Initial Selection:
1. Decorative CMUs, in the form of small-scale units.
2. Colored mortar.
3. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:
1. Exposed Decorative CMUs.
2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
3. Weep holes.
4. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. 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 brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

D. 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 C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. 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 Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. 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.

C. 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.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.
1. Build sample panels for typical exterior wall construction in sizes approximately 48 inches long by 24 inches high by full thickness.
2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall construction in sizes approximately 48 inches long by 24 inches high by full thickness, including face and backup wythes and accessories.
    a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
    b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
    c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    d. Include flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.

5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination."

1.8 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.

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 designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and 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.

1.9 PROJECT 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 down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover 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 ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F 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 ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 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 on burnished locations unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent.
   1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
      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) ACM Chemistries; RainBloc.
         2) BASF Aktiengesellschaft; Rheopel Plus.
         3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

C. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as indicated on the Structural Drawings.
   2. Density Classification: Normal weight unless otherwise indicated.
   3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
   5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

D. Decorative CMUs: ASTM C 90.
1. Products: Subject to compliance with requirements, provide the following:
a. Burnished Face; Match existing; by Acme Brick or approved Equal.
b. Split Face; Match existing; by Acme Brick or approved Equal.
2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as indicated on Structural Drawings.
3. Density Classification: Normal weight.
4. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
5. Pattern and Texture:
a. Standard pattern, burnished finish. Match existing.
b. Standard pattern, split-face finish. Match existing.
6. Colors: Match existing
7. Special Aggregate: Provide units made with aggregate matching existing aggregate.

2.3 MASONRY LINTELS

A. General: Provide one of the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs 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.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, 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.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Mortar Cement: ASTM C 1329.
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. Lafarge North America Inc.; Lafarge Mortar Cement
b. Argos; Magnolia Superbond Mortar Cement.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
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. Davis Colors; True Tone Mortar Colors.
b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
c. Solomon Colors, Inc.; SGS Mortar Colors.

F. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Colored Portland Cement-Lime Mix:
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) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
3) Lafarge North America Inc.; Eaglebond Portland & Lime.
4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.
4. Pigments shall not exceed 5 percent of mortar cement by weight.

G. Aggregate for Mortar: ASTM C 144.
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 thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.

H. Aggregate for Grout: ASTM C 404.

I. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

J. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.

K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
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. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.
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. ACM Chemistries; RainBloc for Mortar.
b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

M. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
   1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
   2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
   3. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
   4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
   5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inchdiameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

D. Partition Top anchors: 0.105-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

2.7 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

D. Postinstalled Anchors: [Torque-controlled expansion anchors] [or] [chemical anchors].
   1. Load Capacity: 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, conducted by a qualified independent testing agency.
   2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
   3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.8 EMBEDDED FLASHING MATERIALS

A. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into

mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.

1. Products: Subject to compliance with requirements, provide the following:

B. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" Section 07 62 00 "Sheet Metal Flashing and Trim" and as follows:
   1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
   2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
      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) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
         2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
         3) Sandell Manufacturing Co., Inc.; Mechanically Keyed Flashing.
   4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
   5. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
   6. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
   7. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
   8. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
   9. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
   10. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 07 62 00 "Sheet Metal Flashing and Trim."
   1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
   2. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, 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, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use one of the following unless otherwise indicated:
1. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.
2. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.
3. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
   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) Advanced Building Products Inc.; Mortar Maze weep vent.
      2) Blok-Lok Limited; Cell-Vent.
      3) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
      4) Heckmann Building Products Inc.; No. 85 Cell Vent.
      5) Hohmann & Barnard, Inc.; Quadro-Vent.
      6) Wire-Bond; Cell Vent.
4. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
   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) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
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. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
   b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
   c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
   d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner..

2.10 MASONRY-CELL INSULATION

A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

B. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
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. Concrete Block Insulating Systems; Korfil.
   b. Shelter Enterprises Inc.; Omni Core.

2.11 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.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.

2.12 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 or mortar cement mortar unless otherwise indicated.
   3. For exterior masonry, use portland cement-lime or mortar cement mortar.
   4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
   5. 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 C 270, the Project Drawings, and the 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 S.
   2. For reinforced masonry, use Type S.
   3. For mortar parge coats, use Type S.
   4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
   5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
   1. Pigments shall not exceed 10 percent of portland cement by weight.
   2. Pigments shall not exceed 5 percent of mortar cement by weight.
   3. Mix to match Architect's sample.
   4. Application: Use pigmented mortar for exposed mortar joints with the following units:
      a. Decorative CMUs.
      b. Pre-faced CMUs.
      c. Concrete facing brick.
      d. Face brick.
      e. Hollow brick.
      f. Glazed brick.
      g. Glazed structural-clay facing tile.
      h. Stone trim units.
      i. Cast stone trim units.

E. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.

3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

F. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
1. Application: Use epoxy pointing mortar for exposed mortar joints with the following units:
a. Pre-faced CMUs.
b. Glazed brick.
c. Glazed structural-clay facing tile.

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 work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

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 cavity and composite walls and other 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 the 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.
1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

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 or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.

3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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, or 1/2 inch 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch 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, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch 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 running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking 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. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. 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.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
   3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 46 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

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. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY-CELL INSULATION

A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story high, but not more than 20 feet.

B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

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.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
   1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 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. Locate joints according to approved Shop Drawings.
   1. Place control joints according to National Concrete Masonry Association TEK 10 “Crack Control in Concrete Masonry Walls”, Table 4.

C. Form control joints in concrete masonry as follows:
   1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
   4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

B. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

C. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.
   1. Fill cavities full height by placing pea gravel in cavities as masonry is laid so that at any point masonry does not extend more than 24 inches above top of pea gravel.

3.12 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 other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

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 ACI 530.1/ASCE 6/TMS 602 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 16 ft.

3.13 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: Level 1 special inspections according to the "International Building Code."
   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. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.14 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.15 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 brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
   6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
   7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
   8. Clean stone trim to comply with stone supplier's written instructions.
   9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.16 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. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 04 22 10 - REINFORCED UNIT MASONRY SYSTEM

PART 1 GENERAL

1. WORK INCLUDED
   - A. Concrete Masonry units.
   - B. Reinforcement, anchorages, and accessories.
   - C. Parged masonry surfaces.

2 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS
   - A. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
   - B. Section 05 50 00 - Metal Fabrications: Fabricated steel items.
   - C. Section 05 21 00 - Steel Joists.

3 RELATED WORK
   - A. Section 01 40 00 - Quality Control: Testing laboratory services.
   - B. Section 04 05 13 - Mortar: Mortar and grout.
   - C. Section 07 92 00 - Caulking: Rod and sealant at control joints.

4 REFERENCES
   - A. ACI 315 - Details and Detailing of Concrete Reinforcement.
   - B. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   - C. ASTM C55 - Concrete Building Brick.
   - D. ASTM C90 - Hollow Load-Bearing Concrete Masonry Units.
   - E. ASTM C145 - Solid Load-Bearing Concrete Masonry Units.
   - F. ASTM C652 - Hollow Brick.
   - G. AWS D12.1 - Reinforcing Steel Welding Code.
   - H. International Masonry Industry All-Weather Council (IMIAC) -Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

5 SUBMITTALS
   - A. Submit shop drawings under provisions of Section 01 33 00.
   - B. Indicate bar sizes, spacing, locations, and quantities of reinforcing steel bending and cutting schedules, and supporting and spacing devices.
   - C. Submit samples under provisions of Section 01 33 00.

6 CERTIFICATES
   - A. Submit manufacturer's certificates under provisions of Section 01 33 00.
   - B. Submit manufacturer's certificate that materials meet or exceed specified requirements.

7 ENVIRONMENTAL REQUIREMENTS
   - A. Cold Weather Requirements: IMIAC - Recommended Practices and Specifications for Cold Weather Masonry Construction.

PART 2 PRODUCTS

1 ACCEPTABLE CONCRETE MASONRY UNIT MANUFACTURERS
   - A. Featherlite.
   - B. Substitutions: Under provisions of Section 00 46 00.

2 CONCRETE MASONRY UNITS
   - A. Hollow Load Bearing Units: ASTM C90, Grade N, Type I normal weight.
   - B. Masonry Units: Modular sized to 8 x 8 x 16 inch; provide special units for 90 degree corners, bond beams, lintels.
   - C. Masonry Units shall be style and color shown on plans.

3 REINFORCEMENT AND ANCHORAGES
   - A. Single Wythe Joint Reinforcement: Truss type, plain steel construction; 3/16 inch side rods as manufactured by Dur-O-Wall.
   - B. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars; plain finish.

4 ACCESSORIES

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A. Control Joints: Preformed rubber or neoprene material.
B. Joint Filler: Closed cell polyurethane oversized 50 percent; self-expanding.
C. Building Paper: Asphalt saturated felt.
D. Nailing Strips: Western softwood, preservative treated, sized to masonry joints.

5 LINTELS
A. As Indicated on Plans.

PART 3 EXECUTION

1 PREPARATION
A. Supply metal anchors to Section 05 50 00 for placement. Direct correct placement.
B. Verify items provided by other Sections of work are properly sized and located.
C. Establish lines, levels, and coursing. Protect from disturbance.
D. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

2 COURSING
A. Place masonry to lines and levels indicated.
B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
C. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal 8 inches. Form raked mortar joints.

3 PLACING AND BONDING
A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
B. Fully bond intersections, and external and internal corners.
C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
D. Remove excess mortar.
E. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

4 REINFORCEMENT AND ANCHORAGES
A. Install horizontal joint reinforcement 16 inches oc.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 24 inches minimum each side of opening.
C. Place joint reinforcement continuous in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.

5 REINFORCING STEEL
A. Place reinforcement in accordance with ACI 315 GR 60.
B. Locate reinforcing splices at points of minimum stress. Review location of splices with Architect/Engineer.
C. Weld reinforcement in accordance with AWS D12.1.
D. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch (13 mm) of true dimension.
E. Verify reinforcement is clean, free of scale, dirt, or other foreign coatings which would reduce bond to grout.
F. All 8" CMU Walls to be reinforced with (1) #4 Vertical at 32" o/c.
G. All CMU Walls to be reinforced with (3) vertical bars at corners, (4) vertical bars at intersections, (2) vertical bars at wall ends and (2) vertical bars at each side of each opening, control joint or expansion joint.
H. Construct Bond beams in all CMU Walls at top of walls, roof and floor levels and at 8'-0" o.c. maximum.

6 TOLERANCES
A. Variation from Unit to Adjacent Unit: 1/32 inch (1.5 mm) maximum.

B. Variation from Plane of Wall: 1/8 inch in 10 feet and 1/4 inch in 20 feet or more.
C. Variation from Plumb: 1/8 inch per story non- cumulative; 1/4 inch two stories or more.
D. Variation from Level Coursing: 1/8 inch in 3 feet 1/4 inch in 10 feet; 1/2 inch maximum.
E. Variation of Joint Thickness: 1/8 inch in 3 feet.mm/m).
F. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

7 CONTROL JOINTS

A. Do not continue horizontal joint reinforcing across control joints.
B. Install resilient control joint in continuous lengths. Heat weld butt and corner joints in accordance with manufacturer's instructions.
C. Size joint in accordance with Section 07 92 00 for sealant performance.

8 BUILT-IN WORK

A. As work progresses, build-in metal door frames, fabricated metal frames, window frames, anchor bolts, plates, and other items to be built in the work supplied by other Sections.
B. Build-in items plumb and level.
C. Bed anchors of metal door and glazed frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with grout minimum 12 inches from framed openings.
D. Do not build-in organic materials subject to deterioration.

9 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves and grounds. Cooperate with other Sections of work to provide correct size, shape, and location.
B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

10 CLEANING

A. Remove excess mortar and smears.
B. Replace defective mortar. Match adjacent work.
C. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.
D. Use non-metallic tools in cleaning operations.

11 PROTECTION

A. Protect finished installation under provisions of Section 01 73 00.
B. Maintain protective boards at exposed external corners which may be damaged by construction activities.
C. Provide protection without damaging completed work.
D. At day's end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

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SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1 WORK INCLUDED
- A. Structural steel framing members, structural steel support members, and with required bracing, welds, and fasteners.
- B. Baseplates, and shear stud connectors.

2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS
- A. Section 03 1000 - Concrete Formwork: Anchorages cast in concrete

3 RELATED WORK
- A. Section 03 30 00 - Cast-in-Place Concrete: Grouting base plates.
- B. Section 05 50 00 - Metal Fabricators.

4 REFERENCES
- A. ASTM A36 - Structural Steel.
- B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- C. ASTM - A325 - High Strength Bolts for Structural Steel Joints.
- D. ASTM – A1072 - Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- E. AWS D1.1 - Structural Welding Code.
- F. TISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

5 SHOP DRAWINGS
- A. Submit shop drawings under provisions of Section 01 33 00.
- B. Indicate profiles, sizes, spacing and locations of structural members, connections, attachments and fasteners.
- C. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

1 MATERIALS
- A. Structural Steel Members: ASTM A36.
- B. Structural Tubing: ASTM A1085.
- C. Bolts, Nuts, and Washers: ASTM A325.
- D. Welding Materials: AWS D1.1; type required for materials being welded.

2 FABRICATION
- A. Fabricate structural steel members in accordance with AISC Specification.
- B. All welding shall be performed by welders certified within previous six months in accordance with AWS specifications.

3 FINISH
- A. Clean and prepare surfaces of all rust, scale, grease and foreign matter in accordance with SSPC-SP2 Hand Tool Cleaning requirements.
- B. Shop prime structural steel with 2 coats of primer, with a minimum wet thickness of 4 mil.
- C. Do not prime surfaces to be field welded or in contact with concrete.
- D. Field touch up all damaged areas with primer after erection.

PART 3 EXECUTION

1 ERECTION
- A. Erect Structural steel in accordance with AISC Specification.
- B. Make provision for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and true alignment until completion of erection and installation of permanent bracing.
- C. Do not field cut or alter structural members without approval of Architect/Engineer.
- D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contract with concrete. Use a primer consistent with shop coat.

END OF SECTION

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SECTION 05 20 00 - METAL JOISTS

PART 1 GENERAL

1 WORK INCLUDED
- A. Open web steel joists, with bridging, attached bearing plates, angles, and anchors.
- B. Loose bearing plates and anchor bolts for site placement.

2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

3 RELATED WORK
- A. Section 05 12 00 - Structural Steel.
- B. Section 05 31 23 - Steel Roof Deck: Support framing for small openings in metal deck.

4 REFERENCES
- A. ASTM A307 - Carbon Steel Threaded Standard Fasteners.
- B. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- C. AWS D1.1 - Structural Welding Code.
- D. FS TT-P-636 - Primer Coating, Alkyd, Wood and Ferrous Metal.
- E. SJI - Standard Specifications for Open Web Steel Joists K- Series, and Standard Specifications for Longspan Steel Joists LH-Series and Deep Longspan Steel Joists DLH- Series.
- F. SSPC 15 - Red Oxide.

5 QUALITY ASSURANCE
- A. Conform to SJI Standard Specifications, Load Tables, and Weight Tables.

6 SHOP DRAWINGS
- A. Submit shop drawings under provisions of Section 01 33 00.
- B. Indicate standard designations, configuration, sizes, spacing, and locations of joists, joist coding, bridging, connections, attachments, and cambers.

PART 2 PRODUCTS

1 MATERIALS
- A. Open Web Joist Members: SJI Type K Open Web.
- B. Joist Girder Members: SJI Type G
- C. Anchor Bolts, Nuts and Washers: ASTM A307.
- D. Primer: SSPC 15, Type 1 red oxide.

2 FABRICATION
- A. Fabricate steel joists in accordance with SJI Standard Specifications.
- B. Provide bottom and top joist chord extensions indicated.
- C. Prepare and shop prime with one coat of primer.

PART 3 EXECUTION

1 ERECTION
- A. Erect steel joists in accordance with SJI Standard Specifications.
- B. Bear joists on supports in accordance with SJI.
- C. During erection, provide temporary bracing for induced loads and stresses.
- D. Field weld joist seat to structural steel after alignment, positioning after installation of bridging.
- E. Do not permit erection of decking until joists are braced and bridged.
- F. Do not field cut or alter joists without approval of Architect/Engineer.
- G. After erection, prime welds, abrasions, and surfaces not primed. Use primer consistent with shop coat.

END OF SECTION

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SECTION 05 31 23 - STEEL DECKING

PART 1 GENERAL

1 SECTION INCLUDES
- A. Steel roof deck and accessories.
- B. Framing for openings up to and including 18 inches.
- C. Bearing plates and angles.

2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
- A. Section 03 30 00 - Cast-In-Place Concrete: Installation of anchors for bearing plates and angles cast in concrete.

3 RELATED SECTIONS
- A. Section 05 12 00 - Structural Steel: Structural framed openings larger than 18 inches.
- B. Section 05 20 00 - Metal Joist.

4 REFERENCES
- A. AISI - Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM A36 - Structural Steel.
- C. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- D. ASTM A525 - Steel Sheet, Zinc-Coated, Galvanized by the Hot-Dip Process.
- E. ASTM A611 - Steel, Cold-Rolled Sheet, Carbon, Structural.
- F. AWS D1.1 - Structural Welding Code.
- G. SDI - Design Manual for Composite Decks, Form Decks, Roof Decks.

5 PERFORMANCE REQUIREMENTS
- A. Design metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks.
- B. Calculate to structural working stress design and maximum vertical deck deflection of 1/240.
- C. Lateral deflection of diaphragm shall not exceed 1/500 of the height of the wall.

6 SUBMITTALS
- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate decking plan, support locations, projections, openings [and reinforcement], pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics and dimensions, structural properties and finishes.
- D. Manufacturer's Installation Instructions: Indicate specific installation sequence and special instructions.

7 QUALIFICATIONS
- A. Installer: Company specializing in performing the work of this Section with minimum 3 years experience.
- B. Design deck layout, spans, fastening and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Texas.

8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to site under provisions of Section 01 5000.
- B. Store and protect products under provisions of Section 01 5000.
- C. Cut plastic wrap to encourage ventilation.
- D. Store decking on dry wood sleepers; slope for positive drainage.

9 FIELD MEASUREMENTS
- A. Verify that field measurements are as shown on shop drawings.

PART 2 PRODUCTS

1 MANUFACTURERS
- A. Vulcraft Product 1.5F22.
- B. Substitutions: Under provisions of Section 01 6000.

2 MATERIALS
- A. Sheet Steel: ASTM A611, Grade C, unfinished.
- B. Bearing Plates: ASTM A36 steel, unfinished.
- C. Welding Materials: AWS D1.1.
- D. Touch-Up Primer: Red oxide type.

3 ACCESSORIES

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A. Flute Closures: Closed cell foam rubber, one inch thick; profiled to fit tight to the decking.

4 FABRICATION

A. Metal Decking: Sheet steel, configured as follows:

Span Design:	Multiple, Minimum 3 Spans.
Minimum Metal Thickness(Excluding Finish):	22 gage
Nominal Height:	1-1/2 inch, fluted profile to SDI
Formed Sheet Width:	36 inch
Side Joints:	Lapped
Flute Sides:	Plain vertical face
Finish:	Baked-on acrylic medium gray primer

PART 3 EXECUTION

1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Beginning of installation means installer accepts existing conditions.

2 INSTALLATION

A. Erect metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks and manufacturer's instructions.
B. Bear decking on masonry support surfaces with 4 inch minimum bearing. Align and level.
C. Bear decking on steel supports with 2 inch minimum bearing. Align and level.
D. Fasten deck to steel support members at ends and intermediate supports with fusion welds at 6 inches oc maximum, parallel with the deck flute and at every other transverse flute.
E. Weld in accordance with AWS D1.1.
F. Mechanically fasten male/female side laps at 18 inches oc maximum.
G. Reinforce steel deck openings from 6 to 18 inches in size with 2 x 2 x 1/4 inch steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
H. Install 6 inch minimum wide sheet steel cover plates, of same thickness as decking, where deck changes direction. Fasten with #12 self-drilling screws at 12 inches oc maximum.
I. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.
J. Install single row of foam flute closures above walls and partitions perpendicular to deck flutes.
K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint.
L. Install 8" minimum wide sheet steel bent cover plates at all ridges and valleys. Fasten with #12 self-drilling screws at 12 inches oc maximum.

END OF SECTION

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SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1 WORK INCLUDED

A. Shop fabricated ferrous metal items, prime painted.

2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish metal fabrications to be cast in concrete to Section 03 30 00 - Cast-In-Place Concrete.

3 RELATED WORK

A. Section 05 12 00 - Structural Steel: Structural anchor bolts.

B. Section 09 90 00 - Painting: Paint finish.

4 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.

C. ASTM A307 - Low-Carbon Steel Externally and Internally Threaded Fasteners.

D. ASTM A325 - High Strength Bolts for Structural Steel Joints.

E. ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.

F. ASTM A500 - Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

G. ASTM A501 - Hot-formed Welded and Seamless Carbon Steel Structural Tubing.

H. AWS D1.1 - Structural Welding Code.

5 SHOP DRAWINGS

A. Submit shop drawings under provisions of Section 01 33 23.

B. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

C. Include erection drawings, elevations, and details where applicable.

D. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

1 MATERIALS

A. Steel Sections: ASTM A36.

B. Steel Tubing: ASTM A500, Grade B.

C. Bolts, Nuts, and Washers: ASTM A307.

D. Welding Materials: AWS D1.1; type required for materials being welded.

E. Primer: Zinc Chromate.

2 FABRICATION

A. Verify dimensions on site prior to shop fabrication.

B. Fabricate items with joints tightly fitted and secured.

C. Fit and shop assemble in largest practical sections, for delivery to site.

D. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.

F. Make exposed joints butt tight, flush, and hairline.

G. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

3 FINISH

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing in accordance with SSPC-SP2 Cleaning Requirements.

B. Do not prime surfaces in direct contact bond with concrete or where field welding is required.

C. Prime paint items scheduled with two coats, minimum of 4 mil. wet thickness.

PART 3 EXECUTION

1 PREPARATION

A. Obtain Architect/Engineer approval prior to site cutting or making adjustments not scheduled.

B. Clean and strip site primed steel items to bare metal where site welding is scheduled.

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C. Make provision for erection loads with temporary bracing. Keep work in alignment.
D. Supply items required to be cast into concrete with setting templates, to appropriate Sections.

2 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Perform field welding in accordance with AWS D1.1.
C. After installation, touch-up field welds, scratched or damaged surfaces with primer.

END OF SECTION

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SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal 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.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

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.

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. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
   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 items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
   5. Wood floor plates that are installed over concrete slabs-on-grade.

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 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 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 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, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:
   1. Framing for raised platforms.
   2. Concealed blocking.
   3. Roof framing and blocking.
   4. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Miscellaneous Framing: Construction or No. 2 grade of any species.

2.5 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. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

C. For utility shelving, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine, No. 2 grade; SPIB.
   2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.

3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

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.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

B. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, marine grade in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
1. Locations: Audiovisual rooms, Electrical rooms, and IT rooms.

2.7 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 with hot-dip zinc coating complying with ASTM A 153/A 153M [**of Type 304 stainless steel**].

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
1. Provide “J” bolts for installation in masonry bond beams.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 METAL FRAMING ANCHORS

A. Stainless-Steel Sheet: ASTM A 666, Type 304 or Type 316.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate [**furring,**] nailers, blocking, [**grounds,] and** similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. 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.

E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. 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 o.c.

G. Sort and select lumber so that natural characteristics will 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. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

J. 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 GROUND, SLEEPER, 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-size furring vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size furring vertically at 16 inches 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 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Foam-plastic board insulation.
2. Vapor retarders.

B. Related Sections: The following Sections contain requirements that relate to this section:
1. Division 04 Section "Unit Masonry" for insulation installed in masonry cells.
2. Division 05 Section “Cold-Formed Metal Framing” for insulation installed in inaccessible spaces.
3. Division 07 Section “Thermoplastic Polyolefin (TPO) roofing
4. Division 09 Section "Gypsum Board Assemblies." for insulation installed as part of metal-framed wall and partition assemblies:

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

D. Research/Evaluation Reports: For foam-plastic insulation.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

C. Identification: For materials not otherwise addressed with certifications, provide R-value identification mark to each piece of building thermal envelope insulation 12 inches (305 mm) or greater in width.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide insulation products by one of the following:
1. Extruded-Polystyrene Board Insulation:
   a. Amoco Foam Products Company.
   b. DiversiFoam Products.
   c. Dow Chemical Co.
   d. UC Industries, Inc.; Owens-Corning Co.
2. Vapor Retarders:
   a. Raven Industries Inc.
   b. Reef Industries, Inc.

2.2 BUILDING INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.
1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Foam Plastic Board Insulation
1. Extruded-Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below:
   a. Type IV, 1.60-lb/cu. ft. minimum density, unless otherwise indicated.
2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.

C. Vapor Retarders:
1. Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm.
   a. Raven Industries Inc.; DURA-SKRIM 6WW.
   b. Reef Industries, Inc.; Griffolyn T-65.
2. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
3. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
4. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, use NT related to exposure, and Use O related to vapor-barrier-related substrates.

2.3 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
   b. Gemco; Spindle Type.
2. Plate: Perforated, galvanized carbon-steel sheet, 0.030-inch thick by 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. AGM Industries, Inc.; Capped Washers.
   b. Gemco; Dome-Cap.
2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a. Perimeter air spaces between precast concrete and masonry walls.

C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
1. Products: Subject to compliance with requirements, provide the following :
   a. Gemco; Clutch Clip.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. AGM Industries, Inc.; TACTOO Adhesive.
   b. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation materials or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Stuff glass-fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.6 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
   1. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
   2. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.7 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

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SECTION 07 46 46 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fiber-cement siding

B. Related Requirements:
1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, grounds, nailers, and blocking.
2. Section 07 25 00 "Weather Barriers" for weather-resistive barriers.

1.2 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: For fiber-cement siding including related accessories.

C. Samples for Verification: For each type, color, texture, and pattern required.
1. 12-inch-long-by-actual-width Sample of siding.
2. 12-inch-long-by-actual-width Samples of trim and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish full lengths of fiber-cement siding including related accessories, in a quantity equal to 2 percent of amount installed.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for fiber-cement siding including accessories.
   a. Size: 48 inches long by 48 inches high.
   b. Include outside corner on one end of mockup.
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.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including cracking and deforming.
      b. Deterioration of materials beyond normal weathering.
   2. Warranty Period: 50 years from date of Substantial Completion

B. Special warranty on Panel Finishes: Manufacturer agrees to repair or replace products that show evidence of deterioration of factory applied finishes within specified warranty period.
   1. Warranty Period: 15 years from date of substantial completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, comparable product by one of the following:
      a. CertainTeed Corporation.
      b. James Hardie Building Products, Inc.
      c. MaxiTile, Inc.
      d. Nichiha Fiber Cement.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 5/16 inch.

D. Horizontal Pattern: Boards 6-1/4 to 6-1/2 inches wide in plain style.
   1. Texture: Wood grain.

E. Factory Priming: Manufacturer's standard acrylic primer. Three shades of gray, as selected by the Architect.

F. Vertical Fiberglass Thermal Spacers: Cascadia Clip

2.3 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
   1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
   1. Corner posts.
   2. Door and window casings.
   3. Fasciae.
   4. Moldings and trim.

C. Flashing: Provide aluminum flashing complying with Section 07 62 00 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
   1. Finish for Aluminum Flashing: Factory-prime coating.

D. Fasteners:
   1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch into substrate.
   2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
   3. For fastening fiber cement, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
   1. Do not install damaged components.
   2. Install fasteners no more than 24 inches o.c.

B. Install joint sealants as specified in Section 07 92 00 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Vapor retarder.
3. Roof insulation.

B. Related Requirements:
1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 07 21 00 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, 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, 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. Review deck substrate requirements for conditions and finishes, 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.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:
1. Sheet roofing, of color required.
2. Walkway pads or rolls, of color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is 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 roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of roofing system.
   2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Carlisle SynTec Incorporated.
   2. Firestone Building Products.
   3. GAF Materials Corporation.
   4. Johns Manville.

B. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base 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. Roofing and base flashings shall remain watertight.
   1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
   1. Corner Uplift Pressure: As indicated in General Notes on the Structural Drawings
   2. Perimeter Uplift Pressure: As indicated in General Notes on the Structural Drawings
   3. Field-of-Roof Uplift Pressure: As indicated in General Notes on the Structural Drawings

D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

E. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

2.3 TPO ROOFING

A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.
   1. Thickness: 60 mils, nominal.
   2. Exposed Face Color: White.

2.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:
      a. Plastic Foam Adhesives: 50 g/L.
      b. Gypsum Board and Panel Adhesives: 50 g/L.
      c. Multipurpose Construction Adhesives: 70 g/L.
      d. Fiberglass Adhesives: 80 g/L.
      e. Single-Ply Roof Membrane Adhesives: 250 g/L.
      f. Single-Ply Roof Membrane Sealants: 450 g/L.
      g. Nonmembrane Roof Sealants: 300 g/L.
      h. Sealant Primers for Nonporous Substrates: 250 g/L.
      i. Sealant Primers for Porous Substrates: 775 g/L.
      j. Other Adhesives and Sealants: 250 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8-inch-thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

H. 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.

2.5 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8 inch thick.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation; GlasRoc Sheathing Type X.
      b. Georgia-Pacific Corporation; Dens Deck or Dens Deck Prime.
      c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing or DEXcell Glass Mat Roof Board.
      d. USG Corporation; Securock Glass Mat Roof Board.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

2.6 VAPOR RETARDER

A. Polyethylene Film: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
   2. Adhesive: Manufacturer's standard lap adhesive, FM Global approved for vapor-retarder application.

2.7 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Carlisle SynTec Incorporated.
      b. Firestone Building Products.
      c. GAF Materials Corporation.
      d. Hunter Panels.
      e. Insulfoam LLC; a Carlisle company.
      f. Johns Manville.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.8 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Modified asphaltic, asbestos-free, cold-applied adhesive.
   2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
   3. Full-spread spray-applied, low-rise, two-component urethane adhesive.

D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation; GlasRoc Sheathing.
      b. Georgia-Pacific Corporation; Dens Deck or Dens Deck Prime.
      c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing or DEXcell Glass Mat Roof Board.
      d. USG Corporation; Securock Glass Mat Roof Board.

2.9 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or Type IV.

B. Asphalt Primer: ASTM D 41/D 41M.

2.10 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16-inch-thick and acceptable to roofing system manufacturer.

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."
   4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

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 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.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 VAPOR-RETARDER INSTALLATION

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively. Continuously seal side and end laps with tape.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSULATION INSTALLATION

A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
   4. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
   5. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

H. 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 in each direction. Loosely butt cover boards together and fasten to roof deck.
   1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

I. Install slip sheet over cover board and immediately beneath roofing.

3.7 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, 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 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 roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.8 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.

3.9 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
   1. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire roof area for potential leaks using electric field vector mapping (EFVM).

B. Flood Testing: Flood test each roofing 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.
   1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
   2. Flood each area for 24 hours.
   3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

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.

3.11 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, inspect roofing 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

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SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Copings.
2. Roof-edge specialties.
3. Roof-edge drainage systems.
4. Reglets and counterflashings.

B. Related Requirements:
1. Section 05 50 00 "Metal Fabrications" for downspout guards and downspout boots.
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
4. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
5. Section 07 92 00 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

C. 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 each type of roof specialty and for each color and texture specified.

D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

E. 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 roof-edge specialties roof-edge drainage systems reglets and counterflashings made from 12-inch 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. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.

D. 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 FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section 07 54 23.

C. 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 as shown on Drawings.
2. Build mockup of typical roof edge as part of Integrated Exterior Mockup specified in Section 01 40 00 "Quality Requirements"
3. Build mockup of typical roof edge, including fascia gutter and downspout , approximately 4 feet long, including supporting construction, seams, attachments, and accessories.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. 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 Section 07 54 23 Thermoplastic Polyolefin ".

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. FM Approvals' Listing: Manufacture and install copings roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-75. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install copings roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
   1. Design Pressure: As indicated on Drawings.

D. 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, ambient; 180 deg F, material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, 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:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
      a. Architectural Products Company.
      b. ATAS International, Inc.
      c. Castle Metal Products.
      d. Cheney Flashing Company.
      e. Hickman Company, W. P.
      f. Merchant & Evans, Inc.
      g. Metal-Era, Inc.
      h. Metal-Fab Manufacturing, LLC.
      i. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.
      j. Petersen Aluminum Corporation.

3. Metallic-Coated Steel Sheet Coping Caps: Zinc-coated (galvanized) steel, nominal 0.028-inch thickness.
   a. Surface: Smooth, flat finish.
   b. Finish: Three-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.
4. Formed Aluminum Sheet Coping Caps: Aluminum sheet, 0.050 inch thick.
   a. Surface: Smooth, flat finish.
   b. Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.
5. Corners: Factory mitered and mechanically clinched and sealed watertight.
6. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
   a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
   b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.3 ROOF-EDGE SPECIALTIES

2.4 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
   1. Architectural Products Company.
   2. ATAS International, Inc.
   3. Berger Building Products, Inc.
   4. Castle Metal Products.
   5. Cheney Flashing Company.
   6. CopperCraft by FABRAL; a Euramax company.
   7. Hickman Company, W. P.
   8. Merchant & Evans, Inc.
   9. Metal-Era, Inc.
   10. Metal-Fab Manufacturing, LLC.

C. Downspouts: Plain rectangular complete with [machine-crimped] [mitered] [smooth-curve] elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Zinc-Coated Steel: Nominal 0.034-inch thickness.

D. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scuppers.
   1. Zinc-Coated Steel: Nominal 0.028-inch thickness.

E. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
   1. Color: As selected by Architect from manufacturer's full range.

2.5 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product 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.

C. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
   1. Zinc-Coated Steel: Nominal 0.028-inch thickness.
   2. Corners: Factory mitered and mechanically 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.
   4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

D. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
   1. Zinc-Coated Steel: Nominal 0.028-inch thickness.

E. 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.

F. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
   1. Color: As selected by Architect from manufacturer's full range.

2.6 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.7 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils 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.
   2. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F.
   3. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Metal-Fab Manufacturing, LLC; MetShield.
      e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. minimum.

2.8 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 Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane 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.

2.9 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.
      b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

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 staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
   1. Apply continuously under copings roof-edge specialties and reglets and counterflashings.
   2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

B. Felt Underlayment: Install with 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.

C. 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.

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. Coat concealed side of [**uncoated aluminum**] [**and**] [**stainless-steel**] roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. 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 with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
   2. When ambient temperature at time of installation is between 40 and 70 deg F, 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 for nails and not less than 3/4 inch for wood screws substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

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.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches; however, reduce pre-tinning where pre-

tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

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 centers.

3.5 ROOF-EDGE SPECIALTIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and [seal with sealant] [solder] to make watertight. Slope to downspouts.
   1. Install gutter with expansion joints at locations indicated but not exceeding [50 feet] <Insert dimension> apart. Install expansion-joint caps.
   2. Install continuous leaf guards on gutters with noncorrosive fasteners, [removable] [hinged to swing open] for cleaning gutters.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
   1. Provide elbows at base of downspouts at grade to direct water away from building.
   2. Connect downspouts to underground drainage system indicated.

D. Parapet Scuppers: Install scuppers through parapet where indicated. 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. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
   2. Loosely lock front edge of scupper with conductor head.
   3. Seal or solder exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.7 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Section 04 20 00 "Unit Masonry" for installation of reglets.

C. 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 over top edge of base flashings.

D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

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 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

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SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof hatches.

B. Related Sections:
   1. Section 05 50 00 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
   2. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
   3. Section 07 71 00 "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.
   4. Section 23 74 13 "Packaged, Outdoor, Central-Station Air-Handling Units" for standard curbs specified with rooftop units.

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. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
   4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

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.

2.2 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Bilco Company (The);TYPE E LADDER ACCESS or a comparable product by one of the following:
      a. Babcock-Davis.
      b. Dur-Red Products.
      c. JL Industries, Inc.; a division of the Activar Construction Products Group.
      d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
      e. Nystrom, Inc.
      f. O'Keeffe's Inc.
      g. Precision Ladders, LLC.

B. Type and Size: Single-leaf lid, 36 by 36 inches <Insert dimensions>.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Zinc-coated (galvanized) steel sheet.
   1. Thickness: 0.079 inch.
   2. Finish: Baked enamel or powder coat.
   3. Color: As selected by Architect from manufacturer's full range.

E. Construction:
   1. Insulation: Cellulosic-fiber board or Glass-fiber board.
   2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
   3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
   4. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
   6. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, galvanized or stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
   1. Provide two-point latch on lids larger than 84 inches
   2. Provide remote-control operation.

G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation;

attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
9. Fabricate joints exposed to weather to be watertight.
10. Fasteners: Manufacturer's standard, finished to match railing system.
11. Finish: Manufacturer's standard .
    a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Steel tube.
4. Finish: Manufacturer's standard baked enamel or powder coat.
    a. Color: Black.

2.3 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90coating designation.

1. 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
2. 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

B. Steel Tube: ASTM A 500/A 500M, square tube.

2.4 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. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.

C. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F thickness as indicated.

D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inchesthick.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

F. Underlayment:
1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil-hick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3 lb/100 sq. ft. minimum, rosin sized.
4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils 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.
5. 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.

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.

2.5 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 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-Hatch Installation:
1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

D. Seal joints with elastomeric sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

B. Clean off excess sealants.

C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

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SECTION 07 72 60 - PERSONAL FALL ARREST SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes site assessment, design, engineering, procurement, fabrication, installation, and testing services for a complete Personal Fall Arrest System supports and anchors for elevated maintenance work, including components, and structure attachments for the following locations:
   1. Catwalks and access ways in interior roof structure of facility.

B. Related Sections include the following:
   1. Division 05 Section "Structural Steel" for structural steel framing system components.
   2. Division 05 Section "Metal Fabrications" for miscellaneous metal components and metal ladders and cages.

1.2 SYSTEM DESCRIPTION

A. General: Provide a complete integrated set of mutually dependent components and assemblies that form a Personal Fall Arrest System, incorporating full body harnesses capable of withstanding structural, personnel, and other loads, and exposure to weather without deterioration. Include primary and secondary accessories complying with requirements indicated. The system shall be comprised of at least the following components;
   1. Body Harnesses
   2. Lanyards
   3. Rope grabs or self retracting lifelines
   4. Steel connectors.

B. The Personal Fall Arrest System shall be designed to allow users to walk uninterrupted the entire length of the system without having to unhitch from the system to pass through intermediate support points. The system shall be designed to support 2 users in case of a fall and to prevent the users from free falling more than the specified limits. The system shall be designed for hands-free operation once the user is properly attached to the system. All components shall be designed by the Personal Fall Arrest System supplier and shall meet the applicable requirements of ANSI A10.14.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Delegated Design: Design personal fall arrest system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Provide Personal Fall Arrest Systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Engineer Personal Fall Arrest Systems in compliance with ANSI Z359.1 “Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.”
      a. Design Loads: Individual users with a capacity of 130 to 310 pounds (59 kg to 140 kg).
      b. Include loads induced by maintenance workers, materials, and equipment.
      c. Maximum Arrest Force: 900 pounds (4.0kN).
      d. Maximum distance for complete stop: 42 inches (1067 mm)

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components, and finishes for each system component:
   1. Structural system.
   2. Accessories.

B. Shop Drawings: For the following system components. Include plans, elevations, sections, details, and attachments to other work.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Anchorage Plans: Submit anchorage plans before installation begins. Include location, diameter, and projection of anchorage required to attach Fall Arrest System to existing structure. Indicate structure reactions at each location.
   3. Structural-Drawings: Show complete fabrication of support system. Indicate welds and bolted connections.
   4. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, inserts, and bolts. Deliver such items to Project site in time for installation

C. Welding certificates.

D. Erector Certificate: Signed by manufacturer certifying that erector complies with requirements.

E. Manufacturer Certificate: Signed by manufacturer certifying that products comply with requirements.

F. Material Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shop primers.

G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. Operation, Inspection, and Maintenance Manual:
   1. Indicating proper procedures and equipment for safe operation of the system.
   2. Include inspection protocols.
   3. Indicating parts list and maintenance requirements for all equipment.

I. Test and Acceptance Certificate:
   1. Indicating completion of proof load testing on installed system, signed by manufacturer’s authorized representative.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing systems similar to those indicated for this Project and with a record of successful in-service performance.

B. The completed fall protection system shall be essentially the product of one manufacturer regularly engaged in the production of such equipment.

C. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

D. 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 design and installations of personal fall arrest systems that are similar to those indicated for this Project in material, design, and extent.

E. All equipment, devices and materials included as part of the above-referenced system shall be supplied by a single source. The supplier shall assume responsibility for proper and complete installation.

F. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

G. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in 01 Section "Project Management and Coordination." Review methods and procedures related to Personal Fall Arrest Systems including, but not limited to, the following:
   1. Inspect and discuss condition of existing structure and other preparatory work performed by other trades.
   2. Review structural load limitations.
   3. Review and finalize construction schedule and verify availability of materials, Erector's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review required testing, inspecting, and certifying procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components so as not to be damaged or deformed. Package parts subject to weathering for protection during transportation and handling.

B. Unload, store, and erect components in a manner to prevent surface damage.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit components to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: When possible, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Coordinate installation of anchorages for fall arrest systems.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering systems that may be incorporated into the Work include, but are not limited to, the following:
   1. Evan Corporation
   2. Flexible Lifeline Systems
   3. Tritech Fall Protection Systems
   4. Unistrut Construction

2.2 COMPONENTS AND ACCESSORIES

A. Body Harnesses, Provide nylon Class III full-body harnesses with back ”D“ ring complying with ANSI A10.32 and as recommended by the Safety Restraint System supplier.

B. Lanyards: Provide adjustable length, tear out shock absorbing, nylon lanyards with double-locking snap assemblies at each end complying with ANSI A10.14 and as recommended by the Safety Restraint System supplier.

C. Rope grabs lifelines: Comply with ANSI A10.32.

D. Self-retracting devices: Comply with ANSI Z 359.1.

E. Steel connectors: Brackets and supports shall be attached to the structure with appropriate anchors of proper size and embedment to adequately support the required loads.

F. Material Control: System components shall contain serial numbers, permanently stamped or engraved, identifying the specific project and application. These serial numbers shall be documented with the Operation, Inspection, and Maintenance Manuals.

2.3 PRIMARY MATERIALS

A. Materials shall be new.

B. System connectors, cables and bolts: Stainless steel, ASTM A666, Type 316. Connectors shall exceed OSHA/ ANSI standards.

C. Fabricated supports required for additional support:
1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, galvanized.
2. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500, galvanized.

D. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
1. Provide galvanized finish.

E. Fasteners: The fall protection system shall be attached to the supporting structure with appropriate fasteners. The fasteners shall be designed to support a load on the fall protection system of 2 times the maximum design load without failure.

F. Single Point Anchors and Tiebacks: Vertical pipe, top plate, rigging shackle, and sling link.
1. Material: ASTM A 36 structural steel, galvanized in accordance with ASTM A123.

2.4 PAINT

A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. Structural Steel Touchup Paint: Match paint material as specified in Division 09 Section Structural Steel Special Coatings.

C. Bituminous Coating: Cold-applied coal tar mastic, SSPC-Paint 33, compounded for 15-mil dry film thickness per coat.

2.5 MISCELLANEOUS MATERIALS

A. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners: Provide Type 304 or 316 stainless-steel fasteners. Select fasteners for type, grade, and class required.

2.6 FABRICATION

A. Fabricate anchoring devices as recommended by manufacturer to provide required support for intended use. Coordinate anchorage system with supporting structure

B. Fabricate joints in a manner to prevent water accumulation. Provide weep holes to drain water which could accumulate in the exposed joints

C. System components shall be of the same material unless otherwise indicated.

D. Exposed work shall be true to line and level with accurate angles, surfaces and with straight square edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Personal Fall Arrest Systems shall be installed by manufacturer‘s authorized trained and certified personnel in accordance with approved shop drawings and manufacturer‘s instructions.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing Personal Fall Arrest Systems to in-place construction.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing Personal Fall Arrest System. Set components accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

D. 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.

E. Install fasteners in accordance with manufacturer‘s recommendations to obtain the allowable working loads published in the product literature and in accordance with this specification.
   1. Do not load or stress Personal Fall Arrest Systems until all materials and fasteners are properly installed and ready for service.
   2. Field Welding: Comply with the following requirements:
      a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
      b. Obtain fusion without undercut or overlap.
      c. Remove existing coatings to bare steel to provide clean substrate for welding as follows:
         1) SSPC-SP 2, "Hand Tool Cleaning."
         2) SSPC-SP 3, "Power Tool Cleaning."
      d. Remove welding flux immediately.
      e. 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.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Sections "Painting” and “Structural Steel Special Coatings.”
   1. In addition to the number of coats specified in schedules in other Division 09 painting Sections, provide additional coats as required to produce the finishes to match existing surfaces.

B. Blending: When painting new substrates patched into existing surfaces, or touching up existing surfaces, furnish finishes specified for the specific substrate. Final finish coat shall be applied over entire surface from edge to edge and corner to corner.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780, Annex A2.

D. Clean system and remove all packing materials from project site.

3.3 TRAINING

A. After Personal Fall Arrest System has been installed, proof tested, and placed into operation the manufacturer's authorized representative shall perform training at the installation site for the Owner's employees and other designated users. Training shall consist of a minimum of 4 hours of hands-on instruction, accompanied by manufacturer's standard printed instructional documents and audio-visual presentations.
   1. Provide a minimum of 6 copies of printed material, and one copy of electronic or video training presentation.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing: After the Personal Fall Arrest Systems is installed and properly tensioned and before permitting use (either temporary or permanent), the safety system manufacturer's approved authorized representative shall inspect and operate the system and shall make all final adjustments for proper operation

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on Personal Fall Arrest Systems.

C. After Personal Fall Arrest System has been placed into operation, the manufacturer's authorized representative shall perform proof testing and issue a Testing and Acceptance Certificate attesting to the conformance of the system with design loads and factors of safety.

END OF SECTION

SECTION 07 84 43 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Joints in or between fire-resistance-rated constructions.

B. Related Requirements:

C. Preinstallation Conference: Conduct conference at Project site.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
   1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
      a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
         1) UL in its "Fire Resistance Directory."
         2) Intertek Group in its "Directory of Listed Building Products."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. 3M Fire Protection Products.
      b. A/D Fire Protection Systems Inc.
      c. Blazeframe Industries.
      d. Grabber Construction Products.
      e. Hilti, Inc.
      f. Metal-Lite.
      g. Nelson Firestop; a brand of Emerson Industrial Automation.
      h. NUCO Inc.
      i. Passive Fire Protection Partners.
      j. RectorSeal.
      k. Roxul Inc.
      l. Specified Technologies, Inc.
      m. Thermafiber, Inc.; an Owens Corning company.
      n. Tremco, Inc.
   2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content:
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, 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: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
   2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
   1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
   2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
   3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing joint firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inchstrokes.
   1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet

B. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

B. Related Requirements:
1. Section 32 13 73 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

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. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. 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. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. 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.

E. Sample Warranties: For special warranties.

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.

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 masonry 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.
   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: 2 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: 10 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 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.
   1. Products: Subject to compliance with requirements, provide the following:
      a. GE Construction Sealants; Momentive Performance Materials Inc.; SWS.

B. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone 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. Dow Corning Corporation; 758.
      b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2350 and SSG4000 UltraGlaze.

c. Polymeric Systems, Inc; PSI-631.
d. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
e. Sherwin-Williams Company (The); White Lightning Silicone Ultra All Purpose Sealant.

C. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone 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. Bostik, Inc; Chem-Calk 1200.
b. Dow Corning Corporation; 999A.
c. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 100 GC, Bondaflex Sil 100 HT.
d. Pecora Corporation; 860.
e. Polymeric Systems, Inc; PSI-601.
f. Sika Corporation; Sikasil-GP.

D. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 799 CCS.
b. Soudal USA; RTV 50.

E. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
1. Products: Subject to compliance with requirements, provide one of the following:
a. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 199 PG, Bondaflex Sil 200 GPN, Bondaflex Sil 201 FC.
b. Sika Corporation; Sikasil-N Plus US.

F. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
1. Products: Subject to compliance with requirements, provide the following:
a. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 200 MJS, Bondaflex Sil 200 SC.

2.3 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; Momentive Performance Materials Inc.; Silpruf NB.
c. Pecora Corporation; 898NST.
d. Tremco Incorporated; Spectrem 2.

C. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.
1. Products: Subject to compliance with requirements, provide the following:
a. Tremco Incorporated; Spectrem 4-TS.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone 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. Dow Corning Corporation; 786-M White.
      b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
      c. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 100 WF.
      d. Soudal USA; RTV GP.
      e. Tremco Incorporated; Tremsil 200.

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 - Construction Systems; Sonolac.
      b. Pecora Corporation; AC-20.
      c. Sherwin-Williams Company (The); 850A Siliconized Acrylic Latex Caulk or 950A Siliconized Acrylic Latex Caulk, White.
      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.

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.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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.
      d. Exterior insulation and finish systems.
      e. <Insert other porous joint substrate>.
   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.
      e. <Insert other nonporous joint substrate>.

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.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

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 exterior and Catering Prep, according to Figure 8B in ASTM C 1193.

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 8 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
      b. Perform one test for each 1000 feet 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 JS-#1.
   1. Joint Locations:
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Joints between plant-precast architectural concrete paving units.
      d. Tile control and expansion joints.
      e. Joints between different materials listed above.
      f. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, M, P, 50, T, NT
   3. Joint-Sealant Color: As indicated by manufacturer's designations

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-#2.
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry.
      c. Joints in dimension stone cladding.
      d. Joints in glass unit masonry assemblies.
      e. Joints in exterior insulation and finish systems.
      f. Joints between metal panels.
      g. Joints between different materials listed above.
      h. Perimeter joints between materials listed above and frames of doors, windows and louvers.
      i. Control and expansion joints in ceilings and other overhead surfaces.
      j. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
   3. Joint-Sealant Color: As indicated by manufacturer's designations.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-#3.
   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: Silicone, S, P, 25, T, NT

3. Joint-Sealant Color: As indicated by manufacturer's designations

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-#4.
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Tile control and expansion joints.
      c. Vertical joints on exposed surfaces of unit masonry and partitions.
      d. Joints on underside of plant-precast structural concrete beams and planks.
   2. Joint Sealant: Silicone, S, NS, 25, NT.
   3. Joint-Sealant Color: As indicated by manufacturer's designations

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-#5.
   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 windows
      c. <Insert other joints>.
      d. Other joints as indicated on Drawings.
   2. Joint Sealant: Acrylic latex.
   3. Joint-Sealant Color: As indicated by manufacturer's designations

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-#6.
   1. Joint Locations:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Insert type of joint sealant in "Joint Sealant" Subparagraph below; coordinate with Part 2. First option is example only
   2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT
   3. Joint-Sealant Color: As indicated by manufacturer's designations

G. Joint-Sealant Application: Concealed mastics JS-#7.
   1. Joint Locations:
      a. Aluminum thresholds.
      b. Sill plates.
      c. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone based.
   3. Joint-Sealant Color: As indicated by manufacturer's designations

END OF SECTION

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:
1. Section Section 04 “Unit Masonry” For building anchors into and grouting hollow metal frames in masonry construction.
2. Section 08 “Door Hardware” for door hardware and coordination requirements.
3. Section 09 “Painting” for field painting hollow metal 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.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, and finishes for each type of hollow metal door and frame specified.

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.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:
1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

E. 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.

F. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

G. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.6 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-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   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 Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the 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. At locations indicated in the Door and Frame Schedule.
   1. Physical Performance: Level A according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
      d. Edge Construction:Model 1, Full Flush.
      e. Core: Vertical steel-stiffener core of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Spaces filled between stiffeners with glass- or mineral-fiber insulation.
   3. Frames:
      a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
      b. Construction: Full profile welded.
   4. Exposed Finish: Prime.

2.3 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
   4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-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, 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 height adjustment. Terminate bottom of frames at finish floor surface.

2.4 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 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, as measured according to ASTM C 143/C 143M.

H. 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.

2.5 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. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
   2. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.

3. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

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. Vision lite 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: 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 from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
    c. Compression Type: Not less than two anchors in each frame.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches 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.
    b. Double-Door Frames: Drill stop in head jamb to receive two 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.

2.6 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.

2.7 LOUVERS

A. Interior Door Louvers: where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
   1. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other, any angle.

B. Exterior Door Louvers: Minimum of 55 percent net free opening.
   1. Weld or tenon louver blades to continuous channel frame and weld assembly to door to form watertight assembly.
   2. Form louvers of hot-dip galvanized steel of same gage as door facings.
   3. Provide louvers with steel-framed insect screens, secured to room side and readily removable. Provide aluminum wire cloth to not reduce net free opening lower than 45 percent. To be coordinated with louver opening to maintain net free area requirements.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch 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. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. 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 or NAAMM-HMMA 840 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. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Steel Doors:
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
      c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
      d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

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.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of manually and electric-motor-operated overhead coiling doors:
   1. Counter doors.

B. Related Sections include the following:
   1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
   2. Division 08 Section "Door Hardware" for lock cylinders and keying.
   3. Facility Services Subgroup Sections for electrical service and connections for powered operators, tie-in to fire-alarm, and accessories.

1.2 DEFINITIONS

A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
   1. Wind Load: Uniform pressures (velocity pressure) indicated in the General Notes on the Structural Drawings, acting inward and outward.

B. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than 100,000 cycles.
   1. Include tamperproof cycle counter.

1.4 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
   1. Summary of forces and loads generated by door system on walls and jambs.

B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.

C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes.

D. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.
   1. Curtain Slats: 12 inches long.
   2. Bottom Bar: 6 inches long.
   3. Guides: 6 inches long.
   4. Brackets: 6 inches square.
   5. Hood: 6 inches square.

E. Qualification Data: For Installer.

F. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.
   1. Obtain operators and controls from overhead coiling door manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Cookson Company.
   2. Cornell Iron Works Inc.
   3. Mahon Door Corporation.
   4. McKeon Rolling Steel Door Company, Inc.
   5. Overhead Door Corp.
   6. Raynor.
   7. Wayne-Dalton Corp.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
   1. Aluminum Door Curtain Slats: ASTM B 209 or ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
      a. Aluminum Extrusion Thickness: Not less than 0.051 inch.
      b. Flat profile slats.
   2. Insulation: Fill slat with manufacturer's standard polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces.
      a. R-Value: 8.
   3. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283 or DASMA 105.
      a. Inside Curtain Slat Face: To match material of outside metal curtain slat.

B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Endlocks for Counter Doors: Manufacturer's standard locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

D. Bottom Bar for Service Doors: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; galvanized, stainless-steel, or aluminum extrusions to suit type of curtain slats.

E. Bottom Bar for Counter Doors: Manufacturer's standard continuous channel or tubular shape, either stainless-steel or aluminum extrusions to suit type of curtain slats.

F. Curtain Jamb Guides for Service Doors: Fabricate curtain jamb guides of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch-thick galvanized steel sections complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.3 HOODS AND ACCESSORIES

A. Hood: Form to act as weatherseal and entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
1. Fabricate hoods for steel doors of minimum 0.028-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
2. Include automatic drop baffle to guard against passage of smoke or flame.
3. Fabricate hoods for aluminum doors, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; 0.032-inch minimum thickness, complying with ASTM B 209.
4. Shape: Round, unless otherwise indicated.
   a. Provide square for fire-rated service doors.

B. Integral Frame, Hood, and Fascia: Provide welded assemblies of the following sheet metal:
1. Fabricate from minimum 0.064-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
2. Fabricate from minimum 0.0625-inch-thick stainless-steel sheet, Type 304, complying with ASTM A 240/A 240M or ASTM A 666.

C. Smoke Seals: Provide UL-listed and -tested smoke-seal perimeter gaskets.

D. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of doors. At door head, use 1/8-inch-thick, replaceable, continuous sheet secured to inside of hood.
1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.
2. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.

E. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
1. Provide pull-down straps or pole hooks for doors more than 84 inches high.

F. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

G. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
1. Locking Bars: Full-disc cremone type, both jamb sides operable from inside and outside.
2. Lock cylinder is specified in Division 08 Section "Door Hardware."

H. Chain Lock Keeper: Suitable for padlock.

I. If door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

J. Provide automatic-closing device that is inoperative during normal door operations, with oscillating or viscous-speed governor unit complying with requirements of NFPA 80 and with an easily tested and reset release mechanism, and designed to be activated by the following:
1. Replaceable fusible links with temperature rise and melting point of 165 deg F; interconnected and mounted on both sides of door opening.

2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
4. Building fire alarm and detection system and door-holder-release devices.

2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.

D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

2.5 MANUAL DOOR OPERATORS

A. Push-up Operation: Design counterbalance mechanism so required lift or pull for door operation does not exceed 25 lbf.

B. Crank-Hoist Operator: Provide crank-hoist operator consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit. Size gears to require no more than 35-lbf force to turn crank. Fabricate gearbox to be oil tight and completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.
1. Provide manufacturer's standard removable operating arm for each crank-gear unit.
2. Provide through-wall shaft operator.

2.6 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Finish:
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.
   1. Install fire-rated doors to comply with NFPA 80.

3.3 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

3.4 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
      a. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors. Refer to Division 01 Section "Closeout Procedures."

END OF SECTION

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SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Nonload-bearing steel framing members for gypsum board assemblies.
   2. Mold and mildew resistant gypsum board panels attached to steel framing.
   3. Tile backing panels attached to steel framing for application of tile

B. Nomenclature: Framing products provided under this Section are indicated on the Drawings as “steel studs.” Structural framing specified in Division 05 Section “Cold Formed Metal Framing” is indicated on the Drawings as “metal framing.”

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide steel framing capable of withstanding design loads within limits and under conditions indicated.
   1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Nonload-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under dead load and a horizontal live load of 5 lbf/sq. ft.
      b. Ceiling Joist Framing: Vertical deflection of 1/240 of the span of the greatest ceiling dimension under dead load and a vertical live load of 10 lbf/sq. ft.

B. Fire Resistivity: Fabricate and install gypsum board shaft-wall assemblies to have fire-resistance ratings indicated.

1.4 SUBMITTALS

A. Product Data for each type of product specified.

B. Shop Drawings showing locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
   1. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; access panels; and special moldings at walls, column penetrations, and other junctures of gypsum board ceilings with adjoining construction.
   2. Minimum Drawing Scale: 1/8 inch = 1 foot.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Steel Framing and Furring:
      a. ClarkWestern Building Systems.
      b. Consolidated Systems, Inc.
      c. Dale Industries, Inc.
      d. Dietrich Industries, Inc.
   2. Gypsum Board and Related Products:
      a. CertainTeed Corporation
      b. G-P Gypsum.
      c. Lafarge North America Inc.
      d. National Gypsum Company.
      e. Temple-Inland
      f. USG Corporation.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

A. General: Provide components complying with ASTM C 754 for conditions indicated.

B. Powder-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 hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190 conducted by a qualified independent testing agency.

C. Wire Ties: ASTM A 641, Class 1 zinc coating, soft temper, 0.062 inch thick.

D. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

E. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch-thick galvanized steel sheet complying with ASTM A 653, G 90 coating designation, with bolted connections and 5/16-inch diameter bolts.

F. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:
1. Carrying Channels: 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.
2. Furring Channels: 3/4 inch deep, 300 lb/1000 feet, unless otherwise indicated.
3. Finish: ASTM A 653, G 60 hot-dip galvanized coating.

G. Steel Studs for Furring Channels: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
1. Thickness: 0.0329 inch, unless otherwise indicated.
2. Depth: As indicated.
3. Protective Coating: ASTM A 653, G 40 hot-dip galvanized coating.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: ASTM A 653, G 60 hot-dip galvanized coating.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
1. Steel Studs and Runners:
a. Minimum Base-Metal Thickness: 0.033 inch.
b. Depth: As Indicated on Drawings.
2. Embossed Steel Studs and Runners:
a. Bass of Design Product: Clark Dietrich ProStud 30 or equal as determined by Architect. Note that ProStud 20 will not be accepted as an equal to a steel stud thickness of 0.033 inch.
1) Products: Subject to prior approval of Architect through Substitution Form, available products that may be incorporated into the Work include the following:
a) Clark Dietrich, ProStud 30.
b) CEMCO; ViperStud.
c) Telling Industries; ViperStud.
b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Slotted Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
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) Clark Dietrich Building Systems; MaxTrak Slotted Deflection Track.
2) Telling Industries; True-Action Slotted Track.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base Metal Thickness: 0.0528 inch (1.5 mm).

E. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth and minimum thickness of base (uncoated) metal as follows:
1. Thickness: 0.0179 inch, unless otherwise indicated.
2. Thickness: As indicated.
3. Depth: 7/8 inch.

F. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

G. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
   1. Widths: Provide gypsum board in widths of 48 inches.

B. Mold and Mildew Resistant Gypsum Wallboard: ASTM C 1396 with moisture- and mold-resistant core and surfaces.
   1. Product: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation, “ProRoc Moisture & Mold Resistant Type X.”
      b. Georgia-Pacific Gypsum LLC, "DensArmor Plus Fireguard Panels."
      c. Lefarge, “Mold Defense Type X.”
      d. National Gypsum Company; “Gold Bond Brand XP Fire-shield Wallboard.”
      e. Temple-Inland, “ComfortGuard.”
      f. USG Corporation, "Sheetrock Mold Tough Firecode."
   2. Core: 5/8 inch, Type X.
   3. Long Edges: Tapered.
   4. Mold Resistance: ASTM D 3273, score of 10.
   5. Location: All dry interior gypsum board partitions.
   6. Applications: Dry interior gypsum board partitions that are scheduled to be painted or tiled, unless otherwise indicated.

C. Abuse and Mold Resistant Gypsum Wallboard: ASTM C 1396, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.
   1. Product: Subject to compliance with requirements, provide the following or comparable product by one of the named manufacturers:
      a. National Gypsum Company; Hi-Abuse XP Wallboard.
   2. Core: 5/8 inch, Type X.
   3. Long Edges: Tapered.
   4. Mold Resistance: ASTM D 3273, score of 10.
   5. Location: Dry interior gypsum board partitions in high traffic areas as indicated on the Drawings.

D. Exterior Gypsum Ceiling Board:
   1. Product: Subject to compliance with requirements, provide the following or comparable product by one of the named manufacturers:
      a. USG Corporation, “Sheetrock Exterior Gypsum Ceiling Board”
      b. American Gypsum “Exterior Gypsum Sheathing”
      c. National Gypsum “Exterior Soffit Board”
   2. Core: 5/8” inch (15.9 mm), Type X.
   3. Long Edges: Tapered
   4. Location: Exterior soffits

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
   a. Cornerbead on outside corners, unless otherwise indicated.
   b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
   c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
   d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
   e. One-piece expansion joint formed with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475/C 475M and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with setting-type joint compound.

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
   1. Ready-Mixed Formulation: Factory-mixed product.
      a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
      b. Topping compound formulated for fill (second) and finish (third) coats.
      c. All-purpose compound formulated for both taping and topping compounds.

2.7 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.

C. 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 thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

B. After sprayed-on fire resistant materials have been applied, remove only as much as needed to complete installation of gypsum board assemblies without reducing thickness of fire resistant materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire resistant materials from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, signage, TV monitor supports, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

E. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
   1. Where building structure abuts ceiling perimeter or penetrates ceiling.
   2. Where partition framing and wall furring abut structure, except at floor.
      a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.
      b. Install deflection track top runner to attain lateral support and avoid axial loading.
      c. Install deflection and firestop track top runner at fire-resistance-rated assemblies where indicated.
         1) Attach jamb studs at openings to tracks using manufacturer's standard stud clip.

F. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
   1. Where studs are installed directly against exterior walls, install asphalt felt strips.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated.
   1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.

F. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.

G. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
1. Install 2 studs at each jamb, unless otherwise indicated.
2. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. 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. Avoid joints other than control joints at corners of framed openings where possible.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
1. Except where 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. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

J. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

K. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply

with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
   1. Space screws a maximum of 12 inches o.c. for vertical applications.

3.6 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:
   1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular 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 board.
      b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application for Curved Surfaces:
   1. On ceilings, apply gypsum board panels before applying panels on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them. Fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.7 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install cornerbead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
   1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
   2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
   3. Install U-bead where indicated.

D. Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect; except, that in no case shall control joints in ceilings, soffits, or partitions be spaced at distance greater than 30”-0”.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.

D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

E. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
   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.
   2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
   3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
   4. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface of the following:
      a. Curved partitions
      b. Partitions with continuous, unbroken length of 20 feet.
      c. Horizontal and vertical surfaces of soffits.

3.9 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Compound for Interior Gypsum Board:
   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.
   5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound, or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

C. Joint Tape and Joint Compound: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Interior Gypsum Board: Open-weave glass mesh, 2” minimum width.
      a. Compound: Ready Mix.
         1) Basis of Design: National Gypsum, Proform Multi-use Joint Compound.
   2. Interior Moisture and Mold Resistant Board: fiberglass mesh, 1.9” minimum width.
      a. Compound: setting type.
   3. Joint Compound for Tile Backing Panels:
      a. Tape: Alkali resistant tape, 2” minimum width.
         1) Basis of Design: National gypsum, PermaBase Cement Board Tape.

b. Compound: Thin set mortar.
1) Basis of Design:
a) Laticrete 254 Platinum per ASTM A-118.4.
b) Laticrete 211 and Laticrete 4237 per ASTM A-118.1.

3.10 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 21 16.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

A. Delegated-Design Submittal: For stud framing at pressurized shafts.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For shaft wall assemblies, from ICC-ES.

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 with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

C. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated on Drawings.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Wall Framing at pressurized shafts: Horizontal deflection of 1/360 of the wall height under a horizontal load of 20 lbf/sq. ft.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: [As indicated] [1 hour] [2 hours] [3 hours] [4 hours] <Insert rating>.

B. STC Rating: 51, minimum.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
   1. Depth: As indicated.
   2. Minimum Base-Metal Thickness: 0.033 inch.

D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
   1. Minimum Base-Metal Thickness: Matching steel studs.

E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

F. Room-Side Finish: Gypsum board.

G. Shaft-Side Finish: [Gypsum shaftliner board, moisture- and mold-resistant Type X] [As indicated by fire-resistance-rated assembly design designation] <Insert finish>.

H. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

A. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

C. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation; ProRoc Moisture and Mold Resistant Shaftliner.
      b. Georgia-Pacific Building Products; Dens-Glass Ultra Shaftliner.
      c. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
      d. PABCO Gypsum; Pabcore Mold Curb Shaftliner Type X.
   2. Thickness: 1 inch.
   3. Long Edges: Double bevel.
   4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Gypsum Board: As specified in Section 09 29 00 "Gypsum Board."

E. Cementitious Backer Units: As specified in Section 09 29 00 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
   1. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 29 00 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
   1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
   2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. Sound Attenuation Blankets: As specified in Section 09 29 00 "Gypsum Board."

F. Acoustical Sealant: As specified in Section 09 29 00 "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames,and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
   1. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch minimum thickness of base

metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Cant Panels: At projections into shaft exceeding 4 inches, install 1/2- or 5/8-inch-thick gypsum board cants covering tops of projections.
   1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft wall framing.
   2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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 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. Green Globes Submittals:
1. Product Data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
2. Provide certificate or letter from Manufacturer stating product was made within 500 miles of the Job Site. Provide certificate or letter from Manufacturer stating fraction, by weight, of product or material was extracted, harvested or recovered within 805 km (500 miles) of the Project job site.
3. Product Data for sealants, documentation including printed statement of VOC content.
4. Laboratory Test Reports for ceiling systems and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
1. Acoustical Panel: Set of 15 cm x 15 cm (6 inchesSamples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 15 cm (6-inch)-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. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.
5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
   2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of typical ceiling area as shown on Drawings.
   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 in original, unopened packages 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 weatherproof, 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.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7.**

B. 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: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

C. 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's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations:
1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

D. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 15% percent.

E. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

F. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 40cm (15-3/4 inchesaway from test surface according to ASTM E 795.

G. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect/Engineer from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 PANEL MANUFACTURERS

A. Basis-of-Design Product: Refer to the Finish Legend in the Drawings. Subject to compliance with requirements, provide product indicated on Finish Legend or comparable product by one of the following:
1. Armstrong
2. USG
3. Rockfon
4. Chicago Metallic

B. Ceilings CL1 (not used) through CL 2:
   1. Refer to the Finish Legend for each Basis of Design product selection details.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
   1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Cast-in-place or Postinstalled bonded anchors.
      b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
      c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
      d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
   2. 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 hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
   3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
   4. Size: Select wire diameter so 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 provide not less than 0.106-inch-diameter wire.

E. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch (22-mmwide; formed with 0.04-inch (1-mm) -thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90coating designation; with bolted connections and 5/16-inch (8-mm)-diameter bolts.

G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.5 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Refer to the Finish Legend in the Drawings. Subject to compliance with requirements, provide product indicated on Finish Legend or comparable product by one of the following:
   1. Armstrong
   2. USG
   3. Rockfon
   4. Chicago Metallic

B. Ceilings CL1 (not used through CL 2:
   1. Armstrong “Prelude” 15/16”.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by the suspension system supplier.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints:
   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. Pecora Corporation.

B. Acoustical Sealant for Concealed Joints:
   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. OSI Sealants; Henkel Corporation.
      b. Pecora Corporation.

C. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
   2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
   3. Acoustical sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
      a. VOC content of 250 g/L or less.

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, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
   1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

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, countersplaying, 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 either to structures 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   7. 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.
   8. Do not attach hangers to steel deck tabs.
   9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   10. Space hangers not more than 48 inches (1.2-mo.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

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 incheso.c. and not more than 3 inchesfrom ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet 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 a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. Install panels with pattern running in one direction parallel to long radial axis of space.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
   3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
   5. 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.
   6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
   1. Compliance of seismic design.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
   1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
      a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 890N (200 lbfof tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 200kg (440 lbf) of tension.
      b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

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. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 61 13 - FLOOR SEALERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes clear penetrating floor sealers for floors indicated in the Finish Schedule and on exterior concrete concourses.

1.2 PERFORMANCE REQUIREMENTS

A. Provide products that comply with the following requirements:
   1. VOC compliant.
   2. Oil and chemical resistance.
   3. Eliminates dusting of concrete surfaces.
   4. Maintains slip resistance of 0.80 dry and 0.69 wet.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for floor sealers.

B. Samples: 12 inch square sample of material on concrete surface.

1.4 QUALITY ASSURANCE

A. Mockups: Cast mockup using project concrete. Replicate joints, surface finish, texture, color, and standard of workmanship of the in-place untreated concrete.
   1. Build mockups in the location and of the size as directed by Architect.
   2. Apply concrete sealers to demonstrate quality of workmanship for the in place application.
   3. Obtain Architect's approval of mockups before starting construction.
   4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
   5. The Owner shall be given the opportunity to accept and approve the slip resistance of the sealed concrete prescribed by the Owner’s insurance and legal counsels.
   6. Demolish and remove approved mockups at the completion of the project.

B. Qualifications: Engage an experienced applicator that employs only persons trained and approved by sealer manufacturer.

C. Concrete Finishing: Comply with requirements of ACI 302 and Division 03 Section “Cast-In-Place Concrete.”

1.5 JOB CONDITIONS

A. Weather Conditions: Proceed with installation when weather conditions are in compliance with manufacturer's recommended limitations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Curecrete Distribution Inc.; Ashford Formula.
   2. Dayton Superior Corporation; Sure Hard Densifier J17.
   3. Euclid Chemical Company (The), an RPM company; Eucosil.
   4. L&M Construction Chemicals, Inc.; Seal Hard.

B. VOC Content: Sealer shall have a VOC content of 0 g/L.

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with manufacturer's instructions for preparation of substrates to receive floor sealer.

B. Clean all floor surfaces of old paint, trash, concrete spillage, etc. to ensure concrete slab to be sealed is restored to original condition.

C. Mask off adjoining surfaces not to receive floor sealer and close off floor drains, to prevent spillage and migration of liquid materials outside membrane area.

3.2 INSTALLATION

A. Apply penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.3 CLEANING AND PROTECTION

A. Provide protections to ensure that work will be without damage or deterioration at time of final acceptance.

END OF SECTION

SECTION 09 65 13096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of profile product indicated.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

D. Product Schedule: For resilient base and accessory products.

1.3 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. Furnish not less than [**10 linear feet**] <**Insert dimension**> for every [**500 linear feet**] <**Insert dimension**> or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Coordinate mockups in this Section with mockups specified in other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

B. In areas where both base and transitions strips are located, provide base and transition strips from same manufacturer to ensure color match.

2.2 THERMOSET-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
   1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
   2. Flexco.
   3. Johnsonite; A Tarkett Company
   4. Roppe Corporation, USA. Pinnacle.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
   1. Style and Location:
      a. Style B, Cove:

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Colors: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75<**Insert number**> percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:
   1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
   2. Tightly adhere to substrates throughout length of each piece.
   3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum horizontal surfaces thoroughly.
   3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

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.

B. Related Requirements:
1. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
2. Section 05 52 13 "Pipe and Tube Railings" for shop priming painting pipe and tube railings.
3. Section 09 96 00 "High-Performance Coatings" for tile-like coatings, and for shop priming structural steel.

1.2 DEFINITIONS

A. Gloss Level 1 (Flat): Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2 (Velvet): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5 (Semigloss): 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7 (High Gloss): More than 85 units at 60 degrees, according to ASTM D 523.

H. Areas Subject to Moisture and Food Preparation: These spaces are those that have permanent plumbing connections and appliances. These include, but are not limited to janitor’s closets, locker rooms connected to shower rooms, first aid rooms, concession stands, and kitchens.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. 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 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 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.
      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.

B. EPA VOC Regulations: All products supplied under this specification section for the locations listed below must be compliant with the VOC limits set in the following districts.
   1. OTC Statutes: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, New Jersey, Delaware, Maryland, Ohio, Illinois, Virginia: the counties of Arlington, Fairfax, Prince William, Stafford and Loudoun.
   2. CARB SCM: California except California South Coast.
   3. SCAQMD rule 1113: California South Coast counties largely comprising the Los Angeles metropolitan area.
   4. LADCO: Illinois, Indiana, and Ohio.
   5. All other states follow USEPA AIM VOC rules.

C. Environment Canada VOC Regulations: All products supplied under this specification section must be compliant with the current VOC limits set by the government of Canada.

1.5 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 gallon of each material and color applied.

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.
   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.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Finishes, Inc.
   3. Sherwin Williams
   4. Tnemec, Inc

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. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
   1. Flat Paints and Coatings: 50 g/L.
   2. Primers: 50 g/L.
   3. Nonflat Paints and Coatings: 150 g/L.
   4. Dry-Fog Coatings: 400 g/L.
   5. Sealers, and Undercoaters: 200 g/L.
   6. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
   7. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
   8. Pretreatment Wash Primers: 420 g/L.
   9. Floor Coatings: 100 g/L.
   10. Shellacs, Clear: 730 g/L.
   11. Shellacs, Pigmented: 550 g/L.

C. Colors: As indicated in a color schedule.
   1. Thirty percent of surface area will be painted with deep tones.

2.3 PAINT, PRODUCTS

A. See Interior Painting Schedule for full coating instructions based on substrate.

B. Block filler: Provide at all new concrete and concrete masonry walls to be painted.
   1. Benjamin Moore: Masonry Interior /Exterior Hi-Build block filler
   2. PPG Professional: Perma-Crete LTC Concrete Block & Masonry Filler.
   3. Sherwin Williams: PrepRite block filler.
   4. Tnemec:

C. Primer: Provide at all new wall construction as indicated in Interior Painting Schedule at the end of this Section.
   1. Gypsum and Plaster substrates: primers to be compatible with substrate and finish coat.
      a. Benjamin Moore, Ultra Spec 500 Interior Primer.
      b. PPG Professional, Pure Performance interior latex primer.
      c. S-W, ProMar 200 zero VOC interior latex primer.
   2. Interior Metals: primers to be compatible with substrate and finish coat.
      a. Benjamin Moore, Super Spec HP Acrylic Metal Primer.
      b. PPG Professional, Coraflon DTM Primer.
      c. Sherwin Williams, Pro Industrial Pro-Cryl Universal Primer.
      d. Tnemec: Tneme-Cryl primer, Series 6.

D. Acrylic Latex:
   1. Benjamin Moore, Ultra Spec 500.
   2. PPG Professional, Lifemaster.
   3. Sherwin Williams, ProMar 200 zero VOC.

E. Epoxy:
   1. Benjamin Moore: Super Spec HP, waterborne polyamide epoxy.
   2. PPG Professional: Aquapon WB water based epoxy.
   3. Sherwin-Williams: Pro Industrial water based Catalyzed Epoxy.
   4. Tnemec: Multi-purpose Epoxy, Series 49.

2.4 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. Concrete: 12 percent.
      a. Allow masonry to cure a minimum of 30 days prior to paint application regardless of moisture content readings.
   2. Fiber-Cement Board: 12 percent.
   3. Masonry (Clay and CMUs): 12 percent.
   4. Allow masonry to cure a minimum of 30 days prior to paint application regardless of moisture content readings.Wood: 15 percent.
   5. Gypsum Board: 12 percent.
   6. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth and complies with the Level standard specified.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

G. 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. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. 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.

F. Un-primed Steel Substrates: Remove oil, grease, dust, dirt, rust, and loose mill scale. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. Shop Priming Preparation: SSPC-SP 7/NACE No. 4.
   2. Field Priming Preparation: SSPC-SP 11.

G. 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.

H. 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.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

L. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth. Exercise care to avoid raising nap of paper.

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 exposed surfaces, except where the Finish Schedule indicates that a surface or material is not to be painted or is to remain natural. If the schedule does not indicate color or finish, match adjacent materials or surfaces.

3. 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.
4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
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 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. Equipment, not 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.
   h. 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.

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. 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.

C. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated; unless noted otherwise in the Construction Documents.
   1. Pipe and Equipment Identification Schedule:
      a. Painting: Paint entire surface of pipe for mechanical and electrical services in accordance with schedule provided on mechanical and electrical drawings and/or contained in mechanical and electrical specifications.

B. **Concrete Substrates**, Nontraffic Surfaces: Not less than 2.5 mills dry, acrylic semi-gloss, over 1 coat of block filler and 1 coat of high performance acrylic concrete/masonry primer, unless otherwise indicated.
   1. Areas Subject to Moisture and Food Preparation: Not less than 3.0 mills dry, water-based 2 part catalyzed semi-gloss epoxy over 1 coat of epoxy filler and 1 coat of epoxy sealer.

C. **CMU Substrates**: Not less than 2.5 mills dry, acrylic semigloss, over 1 coat of block filler and 1 coat of over high performance acrylic concrete/masonry primer, unless otherwise indicated.
   1. Administrative Areas Finish Coats: Not less than 2.5 mills dry, zero VOC latex eggshell.
   2. Areas Subject to Moisture and Food Preparation: Not less than 3.0 mills dry, water-based 2 part catalyzed semi-gloss epoxy over 1 coat of epoxy filler and 1 coat of epoxy primer.

D. **Miscellaneous Steel Substrates**: 1 coat of rust-inhibitive acrylic universal primer, and not less than 2.5 mills dry, zero VOC acrylic semi-gloss.

E. **Shop-Primed Structural Steel Substrates**: High build polyamide epoxy intermediate coat with not less than 2.5 mills dry, zero VOC acrylic semi-gloss.

F. **Galvanized-Metal Substrates**, Except Railings: Acrylic universal primer, and not less than 3 mills dry, zero VOC acrylic semi-gloss.

G. **Galvanized-Metal Railings**: High solids, high build, polyamide epoxy prime coat, with semi-gloss aliphatic acrylic polyurethane finish coat.

H. **Aluminum Substrates**: Acrylic universal primer, and not less than 3 mills dry, zero VOC acrylic semigloss.

I. **Wood Substrates**; Opaque Finish: Latex system.

J. Gypsum Board Substrates:
1. Walls: Not less than 2.5 mills dry, zero VOC latex eggshell over zero VOC interior latex primer.
2. Ceilings: Not less than 2.5 mills dry, zero VOC latex flat over zero VOC interior latex primer.
3. Epoxy: Not less than 3.0 mills dry, water-based 2 part catalyzed semi-gloss epoxy over epoxy primer.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes engineering, furnishing, and installing the following signage and support systems:
   1. Non-illuminated directories.
   2. Room identification signs.
   3. Wayfinding signs.

B. Related Requirements:
   1. Sign Location plans for the signage location.
   2. “Signage Detail Manual” for the signage design details.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide signs and anchorage points capable of withstanding the effects of gravity, wind (up to 110 mph), snow, and seismic loads and stresses, as indicated in the General Notes of the Structural Drawings determined according to the local building code and authorities having jurisdiction.
   1. Deflection of signs and supports in vertical and horizontal direction shall be no greater than 1/360 of clear span or 3/4 inch, whichever is smaller.

B. Thermal Movements: Provide post and panel signs that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions relative to materials, dimensions of individual components, profiles, and finishes for each type of sign material required.

B. Shop Drawings: Submit shop drawings for fabrication and erection of supports and signs. Include plans, elevations, and large scale details of sign wording and lettering layout. Include large scale sections of typical members and other components. Show fabrication joints and fasteners. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
   1. For signage required to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Submit sign layouts for verification, including outline of sign face, character spacing, line spacing, and copy composition. Submit sign layouts for each sign type.
   3. Engineering, fabrication, and construction schedule.
   4. For signs supported by or anchored to permanent construction, provide setting drawings, full-size spacing templates, and directions for installation of anchor bolts and other appropriate anchors to be installed.
   5. Submit drawings in 11 inch by 17 inch format unless otherwise requested by the Architect.
   6. Provide full-color proofs of final printed artwork.

C. Samples: Submit three 6-inchsquare samples of each sign material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including

graphics. One sample set to be kept by Architect, contractor, and client as a record to later match against items in the field.

1. Submit full-size sample units, if requested by Architect. Acceptable units may be installed as part of the work.

D. Provide written documentation that the braille translation included on the manufacturer's signage provided in this section has been evaluated by a Braille translator certified in writing by either The Library of Congress or the National Federation for the Blind, and is, in their opinion, correct and compliant with ADAAG.

E. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. 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 design and installations of signs, and miscellaneous supports that are similar to those indicated for this Project in material, design, and extent.

B. Manufacturer Qualifications: All sign fabrication within this section shall be performed by a manufacturer with a minimum of five (5) years experience producing and installing architectural signs, and a minimum of five (5) years experience producing compliant signs as specified in ANSI 117.1 (1986), Minimum Guidelines and Requirements for Accessible Design (MGRAD), Uniform Federal Accessibility Standards (UFAS) and Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1. For applied graphic films, perform adhesion tests in accordance with manufacturer's written instructions.

C. Drawings and Specifications: The Architect will provide electronic files of typical sign layout drawings in Adobe Illustrator CC format. For electronic files requested in any format other than Adobe Illustrator CC, the Contractor shall reimburse the Owner, for additional services required of the Architect for converting the electronic files. Architect will provide electronic files indicating fonts, preliminary style guides, and key visual parameters of the design intent. Fabricator shall develop and produce final, high resolution camera-ready artwork based on these guides and the details on the Drawings.

1. Drawings and specifications indicate spacings of members, sizes of components, profile, dimensions, materials, and design and fabrication requirements for the signs.
2. Requests for deviations from indicated dimensions and profiles will be considered provided that the intended aesthetic effect is not modified, as judged and approved solely by Architect. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Uniformity of Manufacturer: For each separate type of sign and graphic image required, obtain signs from a single manufacturer.

1. Manufacturer's name, trade name, or trade mark shall not appear on any visible surface.

E. Fire-Test-Response Characteristics: Provide banners and flags constructed of fabrics that are identical to products that pass Test Method 1 of NFPA 701 performed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

F. Aesthetic Requirements: Provide copy with straight and true edges; space characters as indicated; reproduce type style accurately with square corners and even curves; provide uniform letters and symbols; and provide smooth finishes with no visible imperfections.

G. ADA Accessibility Guidelines: Signage shall comply with the ADA Accessibility Guidelines where applicable. Characters and graphics, including but not limited to, copy height, letter stroke,

symbols, materials, and finishes indicated on the Drawings are intended as guidelines for compliance. Implement each applicable ADA Guideline. Should conflicts arise, notify the Architect before proceeding.

H. Mockups: Provide one mockup sign of each type indicated in the schedule at the end of this Section, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and fabrication.
   1. Approved mockups will be forwarded to the Project site and may become part of the completed Work.

I. 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.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish sign dimensions and proceed with fabrication without field measurements. Coordinate fabrication with construction progress to avoid delay.

1.6 COORDINATION AND SCHEDULE

A. Installation: Coordinate installation with the Contractor. For signs supported by or anchored to permanent construction, coordinate specific requirements for types and placement of anchorage devices and similar items to be used for attaching signs.
   1. For signs supported by or anchored to permanent construction, furnish templates to the Contractor for installation of blocking, anchorage devices, and electrical conduits.

B. Prepare a schedule indicating engineering, fabrication, delivery, installation, and final inspection of the Work. Submit this schedule to the Architect and Owner for approval and coordination with other work at the Project Site.

C. Coordinate location of remote transformers with building construction. Ensure that transformers are accessible after completion of Work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Package material in like groups and label accordingly.

B. Protect items during transit, delivery, handling, and storage to prevent damage, soiling, and deterioration. Minor damage to finishes may be repaired provided the final finishes are equal to the original finishes and are acceptable to the Architect. If not acceptable, remove and replace damaged items with new signs.

C. Coordinate delivery and storage of sign materials with the Owner. Schedule delivery to minimize storage requirements. Materials stored at the Project Site without prior approval of the Owner, may have to be relocated at the sign contractor’s expense.

1.8 MAINTENANCE

A. Furnish a list of cleaning materials appropriate for maintenance of signs. Provide written instructions for proper maintenance, electrical access, and character and lighting replacement procedures. Include recommended methods for removal of residual adhesives from wall surfaces after removal of adhered signs.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Use materials of size and thickness indicated or, if not indicated as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.

B. All materials shall be new stock, free from defects impairing strength, durability, and appearance. No fabrication or installation materials or procedures shall be used that will in any way change the usual quality or in any manner have an adverse effect on existing materials and surfaces.

C. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Graphics and Signage Message Schedule, on Drawings, and on preliminary artwork supplied on electronic media by Architect for size, fonts, style, spacing, content, mounting height and location, materials, finishes, and colors of signage.

2.2 MATERIALS

2.3 PLASTIC

A. General: Plastic shall be free of imperfections from forming or fabrication. All surfaces shall be free from scatches and shall be cleaned and polished per manufacturer’s instructions at completion of installation. Edges shall be flame polished, free of saw marks and chips, and be eased, unless otherwise noted.

B. Monolithic Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVF (UV filtering), of thickness indicated, with Finish 1 (smooth or polished finish) and Finish 3 (abrasion resistant coating) as indicated.
   1. Transparent: Provide colorless sheet with visible light transmittance of 92 percent measured per ASTM D 1003.
      a. Provide Finish 3.
   2. Translucent: Provide white translucent sheet of density required to produce uniform brightness and minimum halation effects.
      a. Provide Finish 1.
   3. Opaque: Provide colors and finishes indicated or, if not indicated, as selected by Architect from manufacturer's full range.
      a. Provide Finish 1.

C. Colored Coatings for Acrylic Sheet: For copy and background and frame colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.

2.4 GRAPHIC REQUIREMENTS, GENERAL

A. General: Type style shall be as indicated on the Drawings.
   1. Typeface and numerals shall be computer digitized by one manufacturer and used for each applicable sign types.
   2. Characters indicated on the Drawings are intended as guidelines for layouts and font size only, and are based on scale calculations of the message lengths within given and estimated sign areas. Drawings and schedules indicate the copy required on individual signs. Should conflicts arise in the final message layout, notify the Architect before proceeding.

3. Spelling and punctuation shall be correct. Should an error in spelling or punctuation be found, or the spelling appears questionable, notify the Architect before proceeding.
4. Align letter forms to maintain a baseline parallel to the sign format, unless otherwise indicated. Maintain uniform margins in sign layouts.
5. Suite Identification Signs: Owner will determine names of each individual suite.

B. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
1. Raised-Copy Thickness: Not less than 1/32 inch.
2. For Grade 2 Braille copy, coordinate messages in conjunction with Graphic and Sign Schedule. Braille copy contained on drawings is for size and position only and shall not be used for full message.
3. Symbols and other ADA required symbols, (International Symbol of Accessibility; Symbol of Access for Hearing Loss; International TDD Symbol; and Symbol of Volume Control), which are referenced in the documents, are available in EPS formats on 3-1/2 inch Macintosh discs from the Society for Environmental Graphic Design (SEGD), 47 Third Street, Cambridge, MA 02141, telephone 617/577-8225, fax 617/577-1769.

C. Camera-Ready Artwork: Documents include specifications for all visual elements including, but not limited to, type, symbols, logos, photography, artwork, and arrows. Create final "camera-ready artwork" necessary to complete all signs and environmental graphics based on the design intent included in the Drawings.
1. Typeset copy, high resolution photography, original logos and motifs shall be camera-ready artwork used for fabrication.
2. Owner provided logo, photography and motifs at 300 dpi, not human digitization, may be used for initial layouts prepared for shop drawing review. Do not use printed construction documents as base art.
3. Silkscreens shall be executed from photoscreens or negatives. Pattern cut screens may be used where non-repeat copy is required; however, copy mask shall be equivalent to photoscreen quality. Do not use images indicated on the Drawings as camera-ready art.

2.5 FABRICATION, GENERAL

A. General: Fabricate signs to comply with requirements indicated on drawings for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
1. Form exposed faces and sides of signs to produce surfaces free from warp, distortion, and “oil canning.”
   a. Include internal bracing for stability and attachment of mounting accessories as required.
   b. Cut metal edges on a continuous line and sand smooth. Seams shall be straight and symmetrical.
   c. Form exposed connections with hairline joints, flush, and smooth.
   d. Form exposed work true to line and level with sharp angles, surfaces, and edges. Ease exposed edges to a radius of approximately 1/32 inch (0.8 mm) unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or cracking of applied finishes.
2. Welding, when necessary, shall be of the appropriate type to minimize permanent distortions of flat surfaces. Remove welding flux, oxides and discolorations by pickling or grinding, so that these areas match the finish of the adjacent areas. Repair damage caused by the fabrication by grinding, polishing, or buffing.
   a. Weld corners and seams continuously, complying with AWS recommendations. At connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
3. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

4. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus one percent measured diagonally from corner to corner.
5. Fabricate, brackets and fittings for signs to suit sign panel construction and mounting conditions indicated. Connections, angles, shapes and details shown are suggestive and are to be sized, reinforced and detailed as required. Details not shown are to be equal in quality to those detailed. Factory paint brackets in color matching background color of sign panel.
6. Provide concealed access to internally illuminated signs for relamping and service. Service access shall be waterproof and secured against vandalism.
7. Conceal union, fabricator, or other labels.
8. For sign panel units in exterior applications provide standard weatherproofing construction, including weather-stripping, weeping, and venting provisions for condensation control.

B. Metal signs facing and cladding shall be aluminum unless otherwise indicated or specified

C. Where galvanized steel and aluminum meet, the materials shall be materially isolated from one another to prevent electrolytic action. Aluminum joints and connections shall be heli-arc welded and flush, true, ground, and polished smooth and without defects. Character forms shall be cut true to typeface with no burns or imperfections of any kind.

D. Internal Structure: Provide completely hidden, internal structures for support and anchorage, unless indicated otherwise on the drawings. Primary support structure shall hot dipped galvanized steel or aluminum.

2.6 PANEL SIGNS

A. Exterior Plaque Sign: Provide products fabricated from 0.125 inch aluminum plate with 0.030 inch thick double face tape mounting and silicone adhesive. Sign copy shall be raised 1/32 inch from plaque first surface by manufacturer's standard photochemical process. Provide opaque graphics and Braille to comply with ADA regulations.
1. Finish: As indicated on the Drawings.
2. Graphics: As indicated on the Drawings.

B. Interior Plaque Sign: Provide products fabricated from 0.125 inch thick acrylic with exterior grade polyamide resin sign face and 0.011 inch carrier with 0.030 inch double face tape mounting and silicone adhesive. Sign copy shall be raised 1/32 inch from plaque first surface by manufacturer's standard photomechanical stratification process. Provide opaque graphics and Braille to comply with ADA regulations.
1. Finish: Manufacturer's custom color with matte texture.
2. Graphics: As indicated on the Drawings.

2.7 FABRICATED LETTERS AND NUMBERS

A. Channel Characters: Fabricate letters and numbers to the required sizes and styles, using metals and thicknesses indicated below. Form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories as required. Fabricate by the heliarc welding process.
1. Aluminum Sheet: Not less than 0.090 inch thick.
2. Finish: Manufacturer's custom color urethane.
    a. Color: As indicated on the Drawings.

B. Reverse Channel Characters: Fabricate letters and numbers to the required sizes and styles, using metals and thicknesses indicated below. Form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories as required. Fabricate by the heliarc welding process.
1. Aluminum Sheet: Not less than 0.090 inch thick.

2. Finish: Manufacturer's custom color urethane.
   a. Color: As indicated on the Drawings.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

D. Preparation: Substrates shall be smooth, clean and free of dust, grease, finger prints, or other foreign matter. If necessary to obtain true color application, surface shall be “primed” with white before final color application is applied. Artwork shall be accurately reproduced with all edges straight and true and all finishes smooth and with no visible imperfections
   1. Surface preparation: Follow paint manufacturer’s instructions for preparing surfaces before applying primers or graphics.

E. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, stone, masonry, wood, or dissimilar metals, in exterior work and work to be built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

F. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide custom color matches as selected by the Architect.
   1. Aluminum: Acrylic polyurethane paint as specified in this Section.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Examine area, surfaces and conditions under which the work is to be installed. Notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Starting work implies acceptable surfaces and conditions.

3.2 INSTALLATION

A. General: Locate sign units and accessories where shown on Sign Schedule and sign reference plans, attaching signs to substrates in accordance with manufacturer’s instructions, unless otherwise indicated.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
   2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Surfaces under adhesive applied units shall be smooth, clean, and free of dust, grease, fingerprints, or other foreign matter. All adhesives required shall be used in accordance with recommendations made by the manufacturer of the material to be laminated or adhered. No adhesives that will fade, discolor, or delaminate as a result of ultraviolet light or heat shall be used. Adhesives shall not change the color of or deteriorate the materials to which they are to be

applied. The adhesives shall be of a non-staining, non-yellowing quality. All visible joints shall be free from air bubbles and other defects.

C. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.

D. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
   1. Flush-Mounting: Mount panel signs with backs in contact with wall surface.
   2. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
   3. Hook-and-Loop Tapes: Use hook-and-loop tapes to mount signs to smooth, nonporous surfaces.
   4. Magnetic Tape: Use magnetic tape to mount signs to smooth, nonporous surfaces.
   5. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
   6. Shim Plate Mounting: Provide 1/8-inch-thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
   7. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
   8. Where panel signs are scheduled or indicated to be mounted on glass, provide opaque vinyl film on opposite side of glass to conceal mounting materials. Color of vinyl specified in detail drawings.

E. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
   1. Pin Mounting: A minimum of three threaded studs (1/8 inch diameter by 1/2 inch long minimum) welded to back or bottom of character with no distortions or discolorations to sign face. Appropriately increase size of studs according to weight of characters.
   2. Flush Mounting: Mount characters with backs in contact with wall surface.
   3. Projected Mounting: Mount characters at projection distance from wall surface indicated.

F. Bracket-Mounted or Suspended Units: Use custom fabricated brackets, fittings and hardware as appropriate for mounting signs which project at right angles from supporting elements or suspended from structural members. Attach brackets and fittings with concealed fasteners and anchoring devices, unless otherwise indicated, to comply with the manufacturer's directions.

G. Illuminated Characters:
   1. Run wires into wall construction through conduit. Use insulators as necessary for neon lighting wiring.
   2. Exposed-to-view wiring or conduit on wall face is not permitted.
   3. Engage a licensed electrician to connect wiring to power source.

3.3 FIELD QUALITY CONTROL

A. Within one week of scheduled completion of installation, prepare a punch list itemizing the following:
   1. Uppercase letters instead of lowercase or vice-versa.
   2. Improper alignment of letters on sign panel.
   3. Improper alignment of signs.
   4. Chipped finishes.
   5. Unpainted exposed fasteners.
   6. Fabricator’s label displayed.

7. Improper cleaning of sign surfaces or surrounding wall areas.
8. Damage to surrounding surfaces.
9. Missing signs.

B. Repair or replace damaged units as required after Architect's final inspection.

3.4 PATCH AND ADJUST

A. Patch existing surfaces damaged as a result of work under this section. Patch with same materials as existing. Sign Contractor shall paint and harmoniously blend and contour all repairs to match adjoining conditions.

B. Touch-up any mars or nicks in painted finishes of all signs and adjacent structures. Touch-up shall be the same paint product as used for this sign finish.

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780, Annex A2.

3.5 CLEANING AND PROTECTION

A. At completion of installation, clean exposed sign surfaces in accordance with the manufacturer's instructions. Signs shall be free of glue, fingerprints, dirt, grease, or any other imperfections.

B. Evidence of installation work or damages incurred on other surfaces shall be cleaned or repaired prior to completion of work. Protect units from damage until acceptance by Owner.

C. Remove all packing and construction materials from site. Leave premises clean, ready for work under other contracts or ready for use.

D. Instruct the Owner in writing as to the correct operation and maintenance of all signs and sign components.

E. Demonstrate to the Owner the operation of all access panels, and replacement of lamps, ballasts, and transformers as applicable.

F. Furnish Owner with a pint of each paint and finish material used on sign.

END OF SECTION

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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Public-use washroom accessories.
2. Warm-air dryers.
3. Childcare accessories.
4. Custodial accessories.

B. Related Sections:
1. Section 22 07 19 "Plumbing Piping Insulation" for piping insulation used as underlavatory guards to prevent direct contact with and burns from piping.

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.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: Per manufacturer’s standard from date of substantial completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE 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.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Corporation.
   5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
   6. Tubular Specialties Manufacturing, Inc.

B. Seat-Cover Dispenser T5:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-301 ClassicSeries.
   2. Mounting: Recessed.
   3. Minimum Capacity: 500 seat covers.
   4. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
   5. Lockset: Tumbler type.

C. Toilet Tissue (Roll) Dispenser T6A:
   1. Basis-of-Design Product: To be provided by Client and installed by contractor
   2. Location: MEN’S 201, WOMEN’S 200

D. Twin Jumbo-Roll Toilet Tissue Dispenser T6B:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-2892.
   2. Description: Large Capacity Roll-in-reserve dispenser with secured with tumbler lockset.
   3. Mounting: Surface mounted.
   4. Capacity: Designed for up to 10-inch-diameter tissue rolls (two rolls).
   5. Lockset: Tumbler type.
   6. Location: MEN’S 206, WOMEN’S 207, WOMEN’S 200(ALT #2), MEN’S 201(ALT#2)

E. Grab Bars T9:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-6806 Series.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin).
   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length: As indicated on Drawings.
   6. Roll towel dispensers extend farther from the wall than folded towel dispensers.

F. Liquid-Soap Dispenser T11:
   1. Basis-of-Design Product: To be provided by Client and installed by contractor
   2. Location: MEN’S 201, WOMEN’S 200

G. Mirror Unit T13:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-290 Series.
2. Frame: Stainless-steel angle, 0.05-inch-thick, beveled inside edge.
   a. Corners: Welded and ground smooth.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
   a. Manufacturer's screw locking design wall bracket.
4. Size: 18 by 36 inches, unless otherwise indicated.

H. Vendor T14:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-3706 25 ClassicSeries.
2. Type: Sanitary napkin and tampon.
3. Mounting: Semirecessed for 4-inch deep walls.
4. Capacity: 20 napkins; 30 tampons.
5. Operation: Single coin (25 cents).
6. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
7. Lockset: Tumbler type with separate lock and key for coin box.

I. Liquid-Soap Dispenser T15:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-8226.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Deck mounted on lavatory.
4. Capacity: 34 oz.
5. Materials: Stainless steel, No. 4 finish (satin) piston, spout, and top cover; polyethylene container.

J. Sanitary-Napkin Disposal Unit T17:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-254 ClassicSeries.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

K. Clothes Hook T19:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-2116.
2. Description: Single-prong unit.
3. Mounting: Unit secured to concealed wall plate with setscrews.
4. Material and Finish: Satin nickel-plated brass.

See 10 21 13 for hooks attached to toilet partitions.

L. Paper Towel (Folded) Dispenser T28:
1. Basis-of-Design Product: To be provided by Client and installed by contractor
2. Location: MEN’S 201, WOMEN’S 200

M. Waste Receptacle T29:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-279 Classic Series.
2. Mounting: Surface mounted.
3. Minimum Capacity: 6.4 gal.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Liner: Reusable vinyl liner.

N. Stainless Steel Shelf T22:
1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-295 x 24.
2. Description: With exposed edges turned down not less than 3/4 inch and supported by two triangular brackets welded to shelf underside.
3. Size: 24 inches long by 5 inches deep.
4. Material and Finish: Not less than nominal 0.05-inch-thick stainless steel, No. 4 finish (satin).

2.3 WARM-AIR DRYERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Dryer, Inc.
   3. American Specialties, Inc.
   4. Bobrick Washroom Equipment, Inc.
   5. Bradley Corporation.
   6. Dyson B2B, Inc.
   7. Excel Dryer Corporation.
   8. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
   9. Saniflow Hand Dryer Corporation.
   10. World Dryer Corporation.

B. Warm-Air Dryer T38:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-7128.
   2. Description: Standard-speed, warm-air hand dryer.
   3. Mounting: Surface mounted.
   4. Operation: Electronic-sensor activated, with power cut-off switch when hands removed from the path of sensor.
      a. Operation Time: 90 seconds automatic shut-off after continuous operation.
   5. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
   6. Electrical Requirements: 115 V, 15 A, 1725 W.

2.4 CHILDCARE ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. American Specialties, Inc.
   2. Brocar Products, Inc.
   3. Diaper Deck & Company, Inc.
   4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
   5. Koala Kare Products; a division of Bobrick Washroom Equipment, Inc.
   6. SSC, Inc.
   7. Tubular Specialties Manufacturing, Inc.

B. Diaper-Changing Station, Horizontal T7:
   1. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
      a. Engineered to support a minimum of 200-lb static load when opened.
   2. Mounting: Semirecessed, with unit projecting not more than 1 inch from wall when closed.
   3. Operation: By pneumatic shock-absorbing mechanism.
   4. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color.
   5. Liner Dispenser: Built in.

C. Diaper-Changing Station, Vertical T8:
   1. Description: Vertical unit that opens by folding down from stored position and with child-protection strap.
      a. Engineered to support a minimum of 100-lb static load when opened.
   2. Mounting: Semirecessed, with unit projecting not more than 1 inch from wall when closed.
   3. Operation: By pneumatic shock-absorbing mechanism.
   4. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color.
   5. Liner Dispenser: Built in.

2.5 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Corporation.
   5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
   6. Tubular Specialties Manufacturing, Inc.

B. Utility Shelf T34:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-298 x 18.
   2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
   3. Size: 18 inches long by 8 inches deep.
   4. Material and Finish: Not less than nominal 0.05-inch-thick stainless steel, No. 4 finish (satin).

C. Mop and Broom Holder T35:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-223 x 36
   2. Length: 36 inches.
   3. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
   4. Material and Finish: Stainless steel, No. 4 finish (satin).

D. Towel Pin T36:
   1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-6777.
   2. Description: Projecting minimum of 3 inches from wall surface.
   3. Mounting: Unit secured to concealed wall plate with setscrews.
   4. Material and Finish: Stainless steel, No. 4 finish (satin).

2.6 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

E. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

F. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

G. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.7 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

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.

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.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
   1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Wet-Chemical Type: UL-rated 2-A:K, 2.5-gal. nominal capacity, with potassium acetate-, potassium citrate-, or potassium carbonate-based chemical in stainless-steel container; with pressure-indicating gage.

C. Definition:
1. Fire extinguisher that when wall mounted on a bracket projects less than 4 inches from the face of wall. Complies with protruding object guidelines from ADA and ANSI A117.1.

D. Location: As indicated on Drawings.

E. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

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 black baked-enamel finish.

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: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

PROJECT NAME

SECTION 20 00 00 - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work of Division 20-24 consists of providing labor, materials, products, and all operations required for the complete operating installation of all mechanical systems as shown and specified, in strict compliance with applicable drawings, specification, terms and conditions of the contract and all applicable codes and ordinances governing the installation of the various mechanical systems. Contractor shall provide all equipment and materials necessary and usually furnished in connection with such work and systems whether or not specifically mentioned in the specifications or on the drawings. All work shall be fully correlated with the work of other crafts. This section of Division 20-24 is a part of all other sections of Division 20-24.

B. Each Contractor shall study the Contract Documents included under this contract to determine exactly the extent of work provided under this contract, as well as to ascertain the difficulty to be encountered in performing the work on the drawings and outline hereinafter and in making new connections to existing utilities, installing new equipment and systems and coordinating the work with the other Trades.

C. Notwithstanding any approvals or instructions which must be obtained by the Contractor from the Architect in connection with use of premises, the responsibility for the safe working conditions at the site shall remain that of the Contractor's, and the Architect or Owner shall not be deemed to have any responsibility or liability in connection therewith.

D. The Agreement Forms, Uniform General Conditions, Supplementary Conditions, Division 00 and Division 01 of the specifications shall apply to the work specified in Division 20-24.

E. Additional Site Visit Costs: Contractor shall be charged with any cost resulting from uncompleted items that require additional site trips by the Architect/Engineer.

F. The Contractor shall obtain and pay for all permits and fees associated with his work.

G. REMODEL WORK: COORDINATE ALL CONNECTIONS OF NEW EQUIPMENT WITH EXISTING SERVICE. CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT, MATERIALS, AND INCIDENTAL ITEMS REQUIRED TO MAKE SYSTEM COMPLETE AND OPERABLE.

H. **NO TOXIC OR HAZARDOUS MATERIALS, INCLUDING BUT NOT LIMITED TO PRODUCTS OR MATERIALS CONTAINING ASBESTOS, PCB AND LEAD SHALL BE PROVIDED OR INSTALLED. ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113. ALL PAINTS MUST MEET VOC LIMIT OF GREEN SEAL ENVIRONMENTAL STANDARD GS-11. ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

I. An extra copy of all Field Reports shall be kept in a separate notebook set up in the Construction Manager's Trailer. Contractors shall use these reports to check off that each individual item noted has been completed. Each item shall be initialed and noted when completed. Use this notebook to keep record of all test and results (i.e. wastewater test, water line tests, etc.

J. **Drawings:**
Architectural Background Files – Architectural Revit Models and CAD files to be used for background files, MEP drawings are not background files. Architectural Revit Models and CAD files are used for shop drawings backgrounds. They must be obtained from the architect and cannot be given from the engineer. Reference Architect for cost of Architectural Files.

MEP Drawings – These drawings cannot be used for shop drawings, as they are diagrammatic in nature only. Actual shop drawings prepared by sub-contractors must be used for coordination between all trades. If MEP floorplan files are requested they may be obtained with a signed confidentiality release form, only as outlined below. These files may be used in conjunction with this project only. There are no guarantees of compatibility or accuracy; all technical support will be billed hourly at current Engineer's Rates. Engineer does not charge for actual file, but does charge for time required to prepare the files in format as requested by the Contractor. Fees will be based on Engineer's current hourly rates. Deposit of $500 must be paid prior to beginning file preparation and balance must be paid prior to release of any files. Total fee based on actual time required by Contractor's request. See submittal and shop drawing section for additional information.

MEP CAD Files that will be released.
- If no Architectural RCP is available for light locations. Lighting Floorplans will be released.
- Mechanical Floorplan will be released to Mechanical Contractor for aid in production of his own shop drawings. HCE mechanical drawings may not be submitted as shop drawings.
- Fire Alarm/Fire Sprinkler/Intercom etc… Contractors must use Architectural Backgrounds and Architectural RCP's (when available or lighting floorplan) and **Mechanical Contractor Shop Drawings** for coordination purposes. Do not request MEP floorplans, this portion of specifications will be cut and pasted into an email for you to read.

1.02 PRE CONSTRUCTION MEETING

A. DDC Contractor, Mechanical Contractor, Test and Balance Representative and representatives for each type of HVAC gear that requires interface beyond 'on/off' control will meet in the office of HCE prior to initial control submittal.

B. The purpose of this meeting is to introduce all representatives who will need to coordinate with each other to insure a working project.

C. Each representative is to come prepared with sequences of operation, schematics and written instructions as to which points require what type of signal for each function and how tie-ins and integrations are to occur. If pulsed signals are required to keep a device on, bring it to the attention of the team and provide specific information. Do not assume others understand the inner workings of your gear or controls. Discuss exactly what type signals are acceptable to gear and how to set it up to receive and act on that signal.

D. Newer multistage air volume split systems, RTU's, etc. have different sequences and control tie-ins than older conventional units. Exact requirements for a given type and brand of equipment must be coordinated by the equipment supplier with the Controls Contractor and with the Test and Balance Contractor.

E. Test and Balance Contractor must verify air flow and delta T's at every stage of unit capacity to insure that unit is providing the correct CFM based on the capacity stage it is on so that the unit does not end up with low stage cooling and high stage blower which will not dehumidify. Equipment supplier is to provide Test and Balance Contractor with a quick start up guide to show where and how to set up fan speed selections and outside air dampers so that only

minor balancing occurs at dampers serving grilles.

1.03 SITE INSPECTION

A. Prior to bidding the Contractor shall visit and examine the site verifying all existing items and familiarize himself with existing work conditions and understand the conditions which affect performance of the work of this Division before submitting bids for this work. The submission of bids shall be deemed as evidence of such visits and examinations.

B. All bids shall take the existing conditions into consideration and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility. No subsequent allowance for time or money will be allowed for work or change related to failure to examine site conditions.

1.04 RELATED WORK SPECIFIED ELSEWHERE

A. All work covered by this section of these specifications shall be accomplished in accordance with the respective drawings, information or instructions to bidders, and general provisions of these specifications. Any supplementary conditions, special conditions, addenda, or directives which may be issued by the Owner's representative herewith or otherwise shall be complied with in every respect.

1. Electrical Specifications: Division 26-28.

2. Mechanical, Electrical, Plumbing Drawings

B. Unless otherwise indicated on the Electrical Drawings or in Mechanical Specifications, provide all mechanical equipment motors, motor starters, disconnect switches, thermal overload switches, control relays, time clocks, thermostats, motor valves, damper motors, electric switches, electric components, wiring, and any other miscellaneous Division 20-24 controls.

C. Carefully coordinate all work with the electrical work shown and specified elsewhere in these documents.

D. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than plus or minus 10 percent of rated voltage.

E. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.

F. Size motors for 1.15 service factor, not to exceed 40 degrees temp. Rise above ambient.

G. Provide self-resetting thermal overload switch for fractional horsepower motors.

H. Electrical Contractor to provide conduit and junction boxes for all sensors and exterior conduit for controls to mechanical equipment. Conduit for space sensor to extend from junction box to above accessible ceiling. Conduit for exterior equipment to extend from equipment through wall or roof to above an accessible ceiling. Any control wiring in exposed ceiling areas to be in conduit by Controls Contractor for protection. Controls Contractor to coordinate on all conduit requirements. Coordinate locations with Electrical Contractor.

I. When Mechanical Contractor furnishes motor starter, provide each three phase motor 25 HP and larger with phase failure and phase reversal monitoring relay in all three phases. Relay

shall open motor starter contacts at 10% voltage unbalance and shall automatically reset when voltage returns to normal. Provide adjustable time delay set at .2 second on drop-out to prevent nuisance tripping on momentary voltage dips.

J. Duct smoke detector in supply and return air to be provided by [Mechanical Contractor] Fire Alarm Contractor, installed by Mechanical Contractor, tied into HVAC control circuit by Mechanical Contractor and to fire alarm panel by Fire Alarm Contractor.

K. [Duct smoke detector in supply and return air provided and installed by Mechanical Contractor for units over 2000 cfm and/or units serving rated egress pathways. Provide detectors with remote test switches and audible/visual indicators. Locate them beside unit thermostat unless otherwise noted.]

L. The electrical design and electrical drawings are based on the equipment and/or electric motors of the type, size and electrical characteristics shown and specified on the mechanical drawings and any change in equipment and/or motor size or type brought on directly or indirectly by a substitution of mechanical equipment having characteristics requiring a change, shall be the responsibility of the Mechanical Contractor and the entire cost of such change, including conduit, wiring, motor starting equipment, etc., shall be paid for by the Mechanical Contractor at no additional charge, unless the substitution was initiated by the Owner. Submittals must clearly show any deviations. Mechanical Contractor is responsible for coordinating any required changes with the Electrical Contractor, prior to Electrical Contractors ordering of panels and associated equipment.

M. Mechanical contractor assumes requirements of Controls Contractor when there is no separate Controls Sub-Contractor.

1.05 WORK NOT INCLUDED

A. Certain labor, materials, or equipment may be provided under other sections of these specifications, by utility companies, or by the Owner. When such is the case, the extent, source and description of these items will be as indicated on the Drawings or described in the specifications, but the Contractor is responsible for verifying with all parties involved as to the extent of his requirements of work.

1.06 SPECIFICATION TERMINOLOGY (Definitions)

A. Streamlining: In many instances, the products, reference standards, and other itemized specifications have been listed without verbiage. In these cases, it is implied that the Contractor shall provide the products and perform in accordance with the references listed.

B. "Furnish" means to purchase and deliver material as shown and specified, including mark-ups, and cart the material to an approved location at the site or elsewhere, as noted or agreed.

C. "Provide/Install", as used in these specifications, means furnish all material, labor, sub-contracts, and appurtenances, including mark-up required for a complete, operating, finished system.

D. "Rough-in and Connect Only" means provide an appropriate system connection, such as supplies with stops, continuous wastes with traps, shut-off valves required, and all piping connections, testing, etc., for proper operation, and to install equipment furnished. Equipment furnished is received, uncrated, assembled and set in place by supporting crafts unless they make prior arrangements to hire the mechanical installer for this work.

E. "Accessible" means arranged so that an appropriately dressed maintenance man may approach the area in question with tools and products necessary for the work intended, and may then position himself to properly perform the task to be accomplished, without disassembly or damage to the surrounding installation. It shall also be no more than four feet (4') above a ceiling.

F. "Serviceable" means arranged so that the component or product in question may be properly removed, and replaced without disassembly, destruction, or damage to the surrounding installation.

G. "Product" is a generic term which includes materials, equipment, fixtures, and any physical item used on the project.

H. Wherever the term "shown on drawings" is used in the specifications, it shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.

I. "Conduit" includes, in addition to conduit, all fittings, hangers and other accessories relative to such conduit. "Piping" includes, in addition to piping, all fittings, valves, hangers and other accessories relative to such piping.

J. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, crawl spaces, etc.

1.07 DIAGRAMMATIC DRAWINGS

A. Drawings and specifications encompass a system that will integrate with the structural, electrical, and Architectural design of the building.

1. Drawings and specifications are complementary, each to the other; what is shown on one is as binding as if called for in both.

2. Where drawing details, plans, and/or specification requirements are in conflict, and where conduit, duct and piping sizes of the same run are shown to be different between plans and specifications or details, the most stringent requirement will be included in the Contract. Systems and equipment called for in the specification and/or shown on the drawings shall be provided under the contract of each Trade as if it were required by both the drawings and the specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to the Architect's attention for direction as to what is to be provided.

B. The drawings are partly diagrammatic in character and do not show exact locations, all offsets, or give exact elevation in piping, fittings, duct, conduits, etc. Also, the drawings do not necessarily show in minute detail all features of the installation. Contractor is to install all products coming with manufacturer’s written instructions and installation details per the manufacturer’s instructions, unless specifically instructed to deviate by project engineer. Contact engineer for direction if conflicts occur for direction. Contractor shall physically arrange the systems to fit in the space available and shall carefully investigate structural and finish conditions, arrange work accordingly and provide a complete and satisfactorily working installation. Provide all work shown on the drawings and specified, unless otherwise stated. No subsequent allowance will be made due to failure to coordinate work prior to installation.

C. The Architectural, Structural, Civil and Electrical plans and Specifications and other pertinent documents issued by the Architect are a part of these Specifications and the accompanying Mechanical Drawings and shall be complied and coordinated with in every respect. All

drawings and specifications mentioned above shall be examined by all bidders. Failure to examine all drawings for coordination and quantities shall not relieve the Contractor of responsibility and no subsequent allowance for time or money will be allowed.

1.08 MATERIAL AND EQUIPMENT SUBMITTALS

A. Submittals: Provide submittals for all products and systems described in Division 20-24 and shown on the drawings to demonstrate compliance with the requirements of the project. Furnish equipment submittals in the manner described elsewhere in these specifications.

B. Submit to the Engineer, after the award of the contract or as dictated by project schedule, a type written list of those items of equipment and appurtenances which will be furnished. Include the name or description of the item, name of manufacturer, model or type, catalog number and manufacturer's printed information. The information submitted shall include overall dimensions, weights, voltage rating, phase, wiring diagrams, etc., and nameplate data. Assemble cut sheets into separate submittals as defined in this section or by Specification Section. Submit priority items and long lead time first. Then follow with remaining items. This will allow for faster review and response to accommodate project schedule. **Any submittal with all sections under one (1) cover will be returned and required to be broken into separate submittals.** The Engineer's check will be general and does not relieve the Contractor of final responsibility to comply with the Contract Documents in all respects.

C. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents. Submittals will not be checked for quantity, dimension, fit or proper technical design of manufactured equipment. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provision of a complete and satisfactory working installation is the sole responsibility of the Contractor. **Warranties cannot be reduced through the submittal process.**

D. Contractor shall indicate items being used on cut sheets by highlighting or arrowing to actual part number. Submittals may be returned without checking if submittals not appropriately marked.

E. **'Individual submittals' means separate submittals with unique submittal numbers for each specification section. Separate PDFs for each Submittal number.**

F. HARDCOPY SUBMITTAL REQUIREMENT: Hardcopy submittals will not be required by Engineer.

G. PDF SUBMITTAL REQUIREMENT:
For submittal sections listed below as allowed pdf's the following requirements must be met or the submittal will not get through email security and will be auto-deleted and not checked. Each specifications section must be a separate pdf file, **one giant pdf for all sections will be rejected**.

PDF FILE: MUST BE NAMED AS FOLLOWS:
JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION

EMAIL TITLE/SUBJECT: FOR SUBMITTALS MUST BE AS FOLLOWS:
JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION

Failure to follow these instructions will result in the submittal never reaching the engineer and not being checked. Delays cause by not following these procedures are the sole responsibility of the contractor. Emailed submittals must come from the Architect and must

not be emailed directly from the contractor. Do not Carbon Copy the Engineer on Emailed submittals.

H. **Multiple re-reviews required due to Contractor not following instructions, specifications, etc. will be billed to Contractor at Engineer's current hourly rates. This shall be paid prior to submittal approval.**

I. **SUBMITTALS WILL BE RETURNED IN ORDER OF CONSTRUCTION OF THE PROJECT, NOT NECESSARILY IN ORDER SUBMITTED**. If all sections are submitted under one binder and transmittal, each section will be returned at the appropriate time for construction phasing. Mechanical Equipment will not be reviewed until "Mechanical/Electrical Coordination Sheet" has been submitted. Mechanical Equipment, Mechanical Controls and Plumbing Fixtures may require extended review time. **IF SUBMITTALS ARE SUBMITTED EARLY RELATIVE TO CONSTRUCTION PHASING, SUBMITTALS MAY BE HELD, REVIEWED AND RETURNED AT THE APPROPRIATE TIME FOR CONSTRUCTION PHASING, NOT NECESSARILY 2 WEEKS.**

J. **DO NOT SUBMIT THE FOLLOWING SECTIONS UNLESS DEVIATING FROM THE SCHEDULES/SPECIFICATIONS. Provide directly to General Contractor/CMR for inclusion into O & M Manuals. If deviating from the specifications submittal will be required. (Write summary sheet of deviations and highlight items that are different to allow for proper review.):**

1. 20 01 00 – Basic Materials and Methods – Only items listed
   - Valve Tag / Markers
   - Pipe Identification / Labels
   - Access Panels / Doors
   - Valves
2. 20 07 00 – Insulation – Only items listed
   - Insulation
   - Duct Tape
3. 22 11 17 – Relief Valves
4. 22 13 16 – Liquid Waste Transfer
5. 23 30 00 – Air Distribution – Only items listed
   - Isolators
   - Spin-in Fittings
   - Fire Dampers Installation Detail
   - Fire Damper
   - Flexible Connector
   - Fire Smoke Dampers / Details
   - Flexible Duct
   - Volume Damper
   - Air Extractors

K. **PDF Submittals Allowed** for Product Cut-Sheets for are limited to the following items: **Separate PDF for each Submittal number is required.**

1. 20 00 00 – General Provisions – Only items listed
   - Roof Opening Shop Drawings
   - Mechanical/Electrical Coordination Sheet
2. 20 01 00 – Basic Materials and Methods – Only items listed
   - Fire Proofing/Fire Caulk
   - Piping
3. 20 07 00 – Insulation – Only items listed

- Metal Jacket & Fittings
- Internal Lining

4. 21 00 00 – Fire Sprinkler Product Data
5. 22 11 16 – Water Distribution Systems – Only items listed
   - Water Hammer Arrestors
   - Piping
6. 22 11 17 – Water Heaters
7. 22 13 16 – Liquid Waste Transfer – Only items listed
   - Cleanouts
   - Piping
8. 22 13 17 – Acid Waste Piping – Only items listed
   - Acid Dilution Basin
9. 22 30 00 - Plumbing Fixtures and Trim – Only items listed
   - Plumbing Fixtures and Trim
   - Floor Drains
10. 23 09 XX – Controls
11. 23 30 00 – Air Distribution – Only items listed
    - Louvers/Hoods
    - Grilles/Registers/Diffusers
    - Exhaust Fans
    - Supply Fans
    - Unit Heaters
12. 23 63 01 – Chilled and Hot Water Systems – Only items listed
    - Pumps
    - Chillers
    - Boilers
13. 23 70 XX – Mechanical HVAC Equipment - Only items listed
    - Condensers
    - Condensing Units/Heat Pumps
    - Air Handlers
    - Rooftop HVAC Units
    - Makeup Air Units

L. Data Required for Review: Mark submittal literature and shop drawings clearly by individual sections, and include all equipment and material shown on drawings and specified. ANY DATA NOT CLEARLY MARKED OR NOT APPROPRIATELY SUBMITTED WILL BE RETURNED WITHOUT CHECKING. Indicate the following:

1. Specification reference and/or drawing reference for which literature is submitted for review with an index, following specification format, and item by item identification.
2. Manufacturer's name and address, and supplier's name, address, and phone number.
3. Catalog designation or model number.
4. Rough-in data and dimensions.
5. Performance curves and rated capacities with performance data marked.
6. Motor characteristics and wiring diagrams.
7. Operation characteristics.

8. Complete customized listing of equipment, characteristics, accessories, etc., specified. Indicate whether item is "As specified." Mark out all non-applicable items. The terminology "As specified" used without this customized listing is not acceptable.

9. Wiring diagrams for the specific system operation. Complete wiring with diagrams showing all connections to each type of actual equipment being installed on project, complete with part numbers of controls for each type of equipment.

10. **Submit written sequence of operation for all modes of operation for each piece of mechanical equipment. Give narrative explaining exactly what control signals are required to activate <u>each</u> mode of a particular unit's operation. Include information about which signals override others internally (when applicable). Submit this information with equipment submittal and provide a copy to the Controls Contractor so it can be integrated into the control scheme and control submittals. Indicate whether 24 VAC, 4-20 MA, 0-10VDC or line voltage is required for controls.**

11. **Provide HVAC equipment with a controls interface that is suitable for connection to a standard conventional thermostat and/or non-proprietary DDC control systems.**

12. **Ductwork Shop Drawings: Engineer requires 1 (one) HARDCOPY, full-size at 1/8" scale, sheets size to match project for engineer review and engineer records. Additional copies per Architect and Owner requirements. PDF's will be required for owner and architect records.**

13. **<u>BREAKOUT SUBMITTALS INTO PRIORITY ITEMS.</u>**

M. **Contractor to submit "Mechanical/Electrical Equipment Coordination Sheet" with equipment submittal for all HETD's, RTU's, GU's, AHU's, CU's, HP's and MAU's. Reference chart at end of section.**

N. When requested, present samples of all materials proposed for use to the Engineer for his approval.

O. Certify Shop Drawings have been checked for compliance with Contract Documents. Certify that the materials submitted can be delivered and installed according to the construction schedule.

P. Select all other materials, not specifically described on the Drawings or in these specifications but required for a complete and operable facility, and submit to the Engineer for approval.

Q. **Substitutions:** ("Substitution Request" form must be submitted)

1. Equipment listed as equal is indicated to be equal in quality to equipment designed around. It does not mean equal in dimension or fit. It is the Contractor's responsibility to confirm dimensional differences and space requirements.

2. Request for proposed substitution of materials, methods, or processes shall be made to the Architect and if found acceptable, will be confirmed by an addendum to the Construction Documents. Where proposed substitutions are not incorporated into the Construction Documents by addendum **PRIOR** to time of the General Contract bid opening, all bids shall be held to have been made on the basis of the materials, methods and processes required by the Construction Documents.

3. [If, after the award of the Contract, substitutions are desired, request permission in writing from the Engineer still using “Substitution Request” form.

   a. In the request for substitution, state the amount of adjustment to be made in the contract price in order to give the Owner the benefit of any savings in materials or labor costs.

   b. All substitutions shall be of equal or better quality to the equipment specified.]

4. Equal Materials: It is not the intent of the Specifications to limit materials to the product of any particular manufacturer. Where definite materials, equipment and/or fixtures have been specified by name, manufacturer or catalog number, it has been done so as to set a definite standard and a reference for comparison as to quality, application, physical conformity, and other characteristics.

5. Acceptance of substitution by the Engineer does not relieve the Contractor of responsibility for proper operation of the systems, compliance with specifications, necessary changes due to dimensional differences or space requirements, and of work on schedule.

6. Where equipment of the acceptable manufacturers requires different arrangement or connections from those shown, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Architect, the Contractor proposing substitutions shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all necessary changes in all affected related work provided under other Sections, including location of rough-in connections by other Trades, conduit supports, insulation, etc. All changes shall be made at no increase in the Contract amount or additional cost to the other Trades and/or Owner.

7. **Submit fully completed “Substitution Request” form located at end of this section. If this form is not submitted, all substitution request will be automatically rejected.**

8. **For substitutions that require substantial review by engineer to ensure equality, the contractor requesting substitutions shall reimburse the engineer at current hourly rates for all review time. This shall be paid prior to submittal approval. This applies to all equipment not previously approved on construction documents.**

   a. Mechanical Equipment
   b. Contractor Cost Savings Packages Requiring Substantial Review Time

1.09 SHOP DRAWINGS REQUIRED

A. Prepare and submit working construction drawings as requested, specified, and otherwise necessary to demonstrate proper planning for installation and arrangement of all work. Layout drawings to scale and show dimensions where accuracy of location is necessary for coordination or communication purposes. Show work of all trades, including Architectural, Structural, Mechanical, and Electrical items which may be pertinent to proper and accurate coordination. Provide shop drawings for all products, ductwork, systems, system components and special supports which are not standard catalog products and which may be fabricated for the Contractor or by the

Contractor. Show top and bottom elevation of ductwork and equipment as it will be installed. Show offsets required to miss structural and other items of interference. Identify all shop drawings as to which section and paragraph of the specifications and/or drawing number the item is covered under. Ductwork layout/shop drawings to be done at a minimum 1/8" = 1'-0" scale. AHU's, CU's, HP's, RTU's, etc. are to be shown actual scaled size and configuration of the actual equipment being used.

B. Architectural Revit Models and CAD files to be used for backgrounds in preparation of ductwork and sprinkler shop drawings and shall be obtained from the Architect. Confirm requirements and stipulations for obtaining floor plan backgrounds with Architect and with other sections of specification. Engineer's drawings and CAD files **may not** be used for Shop Drawings. Reference 1.01,J.

C. ALL SHOP DRAWINGS OF MECHANICAL ROOMS/MEZZANINES SHALL SHOW ALL FLOOR DRAINS, HVAC, PLUMBING, AND ELECTRICAL EQUIPMENT, INCLUDING ELECTRIC PANELS, TRANSFORMERS AND DISCONNECT SWITCH LOCATIONS. COORDINATE WITH ELECTRICAL AND PLUMBING CONTRACTOR.

D. Provide roof shop drawing indicating dimensioned locations and sizes for all roof mounted equipment, supports, openings and plumbing vents in ample time for proper coordination of all trades.

E. Submission of copies of the Engineer's drawings does not constitute shop drawings and is not acceptable.

F. Submittal of complete engineering submittal data for products and equipment shall be made in sufficient copies to provide one (1) hardcopy of all data to be retained by the Engineer, additional copies as required by the Contractor, Architect and Owner. Provide an electronic copy in PDF format and CAD if available for record keeping purposes for Engineer, Architect, and Owner with close out documents described elsewhere in specifications.

G. General Contractor shall transmit a CAD copy of ductwork shop drawings to sprinkler contractor prior to submission of sprinkler shop drawings.

H. Ductwork shop drawings shall be submitted and reviewed prior to any ductwork being installed.

I. MECHANICAL CONTRACTOR MUST SUBMIT "MECHANICAL/ELECTRICAL COORDINATION SHEET" WITH MECHANICAL EQUIPMENT SUBMITTAL FOR PROPER COORDINATION PURPOSES WITH ELECTRICAL CONTRACTOR FOR ACTUAL EQUIPMENT BEING INSTALLED OR SUBMITTAL WILL BE REJECTED.

1.10 RECORD DRAWINGS

A. Reference requirements stated elsewhere in the Specifications.

B. THE CONTRACTOR SHALL TAPE ALL ADDENDA'S ISSUED DURING BIDDING TO HIS CONSTRUCTION AND RECORD DRAWING SET PRIOR TO COMMENCING CONSTRUCTION. PAY REQUESTS WILL NOT BE PROCESSED UNTIL THE CONTRACTOR HAS COMPLIED WITH THIS REQUIREMENT.

C. In addition to other requirements, a master Record Drawing print set (separate from field sets) shall be kept in the General's site trailer and marked up weekly as the work progresses, to show exact dimensioned location and routing of all mechanical work which will be permanently concealed. Show routing and location of items cast in concrete or buried underground. Work located in spaces with access, or above suspended ceilings, is not

considered permanently concealed. Show complete routing and sizing of any significant revisions to the systems shown. Show the location of all valves and their appropriate tag identification. Indicate locations of all existing active and inactive piping uncovered during construction. **Keep marked up set at site for review at site meetings.**

D. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed for draw requests. They shall be inspected periodically by the Architect and Owner's Representatives, and they shall be corrected immediately if found either inaccurate or incomplete. **This procedure is mandatory.**

E. The Contractor shall be responsible for updating and/or marking all items, including but not limited to floor plan changes, system changes, addendums, change orders, etc. on the prints to “As-Built” conditions. At the completion of the job, marked up As-Built Drawings shall be submitted to the Architect for final review and comment. These corrected prints together with corrected prints indicating all the revisions, additions and deletions of work, shall form the basis for preparing a set of record drawings.

F. Using the “Record Drawing Set”, the Contractor shall print two (2) complete sets of prints one for submission to the Owner and one rolled in a 4” PVC pipe in main electric room mounted to wall and labeled. Tape all edges. The contactor shall provide pdf copies/scans for owner record purposes.

G. The Contractor shall bear all the costs of producing the “Record Drawing Set”.

H. All equipments **model and serial numbers** must be included on start up forms turned in to the owner. **Reference Cx Commissioning specifications for additional information and requirements.** For split systems, this includes all model and serial numbers for all indoor sections or components as well as outdoor units. These are required for owner inventory and for processing of any utility rebate forms. Utility rebates require the model and serial numbers associated with a given unit number to match, in case the job is spot checked prior to issuing a rebate.

1.11 CODES, REGULATIONS AND ORDINANCES

A. All work shall comply with the current applicable local, state and federal codes and ordinances. Follow recommended practices as set down by ASME, SMACNA, ASHRAE, NFPA, applicable Building Code, applicable Mechanical Code, applicable Plumbing Code, National Electrical Code (NEC), AGA, ADA AND OSHA, as they apply to this project, except in cases where local statutes govern. The contractor shall verify with the latest adopted local codes, ordinances and amendments that apply to this project with the authority having jurisdiction. **PROVIDE LOCKING REFRIGERATION ACCESS PORT CAPS FOR ALL EQUIPMENT WITH REFRIGERANT LOCATED OUTDOORS ON GROUND OR ON ROOF.**

B. In cases of difference between Building Codes, State Laws, Local Ordinances and Industry Standards and the Contract Documents, each Subcontractor shall promptly notify the Architect in writing of any such difference, as applicable to his work.

C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern.

D. Should the Contractor perform any work that does not comply with the requirements of the applicable Building codes, State laws, Local Ordinances and Industry Standards, he shall bear all costs arising in correcting the deficiencies, as approved by the Architect.

1.12 DELIVERY AND STORAGE OF EQUIPMENT AND MATERIAL

A. All equipment and materials shall be protected from physical, moisture absorption, metallic corrosion and weather damage from the time of delivery until completion of the project. This includes erection of temporary shelters and covering items in the building with protective covering. Store items subject to moisture damage such as controls in dry, heated space. Failure to comply with the above to the satisfaction of the Owner/Architect will be sufficient cause for the rejection of the equipment or material in question. Upon such rejection, the damaged equipment or material will be completely replaced with new by the Contractor at no charge to the Owner.

B. Provide covers on all ends and openings of pipes, conduits, ducts, etc. to keep out insects, dirt, dust and debris during entire construction process. This includes properly covering unassembled ductwork, etc. stored on jobsite prior to installation.

C. The Manufacturer's directions are to be followed from delivery, storage, protection and installation of equipment and materials. Notify the Architect in writing of conflicts between requirements of Contract Documents and manufacturer's direction.

D. Large pieces of equipment which are too large to permit access through doors, stairways or access opening shall be placed in the space before enclosing the structure. After equipment is placed, it shall be thoroughly protected from damage.

1.13 CLEAN-UP

A. Remove debris and waste materials from within the construction areas and transport off-site, daily.

B. Keep the construction area clean, free from hazard, and orderly arranged.

C. Pay all costs of waste removal and disposal. Reference General Conditions for further information.

D. Dispose of waste materials in accordance with all regulations which govern.

E. Take all precautions to protect persons who enter the construction area from hazardous conditions, hazardous waste, toxic waste, or other unsafe conditions.

F. Upon completion of construction, remove all debris, waste materials, unused materials, temporary constructions, vehicles, tools, fencing, etc. to Owner’s satisfaction.

G. All equipment and materials shall be protected from physical moisture absorption, metallic corrosion and weather damage from time of delivery to completion of project. Replace any damaged materials.

PART 2 – PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Unless otherwise indicated, provide only new equipment and materials.

B. On all major equipment components, provide manufacturer’s name, address, model number, and serial number permanently attached in a conspicuous location.

C. All materials furnished under these specifications shall be the standard product of manufacturers regularly engaged in the production of such equipment and shall be the

manufacturer's latest approved standard design.

D. GUARANTEE

1. The Contractor and Manufacturers shall provide a ONE (1) YEAR guarantee for all work under the Electrical, HVAC, Plumbing and Fire Protection Trade. However, such guarantees shall be in addition to and not in lieu of all other liabilities which the manufacturer and Contractor may have by law or by other provisions of the Contract Documents. **In any case, such guarantees and warranties shall commence when the Owner accepts the mechanical/electrical system, as determined by the Architect.**

2. All materials, items of equipment and workmanship furnished under each Section shall carry a ONE (1) YEAR warranty against all defects in material and workmanship. Any fault under any Contract, due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the Contractor for the work under his Contract, including all other damage done to areas, materials and other system resulting from this failure.

3. The Contractor shall guarantee that all elements of the system, which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.

4. Upon receipt of notice from the Owner of failure of any part of any systems or equipment during the guarantee period, the affected part or parts shall be replaced by the Contractor for his respective work, as applicable.

5. Additional extended guarantees required for work on this project. The additions and/or extensions to the standard one year guarantee previously described are to be provided in writing, by the manufacturer or an approved insurance underwriter. The guarantee is to cover all parts and/or labor as specified below.

Master Extended Guarantee List: (All items are not used on all jobs)

a. Gas heat exchangers in all furnaces, make-up air heaters, "neutral air" make-up air units, high efficiency triple deck (HETD) units, unit heaters and packaged rooftop units to have an additional nine (9) year parts only guarantee. (Non-prorated)

b. All comfort air conditioning and heat pump compressors are to have an additional four (4) year parts only guarantee. (Non-prorated)

c. All computer grade HVAC equipment compressors are to have an additional one (1) year parts only guarantee. (Non-prorated)

d. All "neutral air" make-up air units and high efficiency triple deck (HETD) units are to have the following additional guarantees (Non-prorated):

1) Two (2) year total unit performance.

2) Additional four (4) year parts on compressors.

3) Additional four (4) year parts and performance on total enthalpy and sensible recovery wheels, heat pipes, plate and frame exchangers

and run around loops.

4) Provide unit with one (1) spare belt for each fan and wheel to be used at Owner's discretion after the guarantee period expires.

5) Additional one (1) year parts and labor on entire make-up air unit package against water leaking into the unit and/or into the building through any roof curb mounted unit. Manufacturer's representative is to certify proper installation on each unit in writing.

e. All chillers to have additional (4) four year manufacturer's parts and labor, bumper to bumper guarantee (Non-prorated), including refrigerant.

f. Gas radiant heaters to have additional 1 year parts warranty on controls and additional 14 year parts warranty on the "effect" tile stainless steel burners.

6. Furnish, before the final payment is made, a written guarantee covering the above requirements.

7. Additional/extended guarantees listed above are Non-negotiable, and can't be amended through the submittal process.

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING

A. The Contractor shall notify the General Contractor and other Subcontractors in ample time of the location of all chases, sleeves and openings required in the construction for the proper installation of his work. The Contractor shall do all core drilling of individual holes and all cutting for his work, except square or rectangular openings in the structural slabs, which shall be cut by the Contractor at locations shown on the drawings. In no case, however, shall a beam or column be cut without the approval of the Project Structural Engineer.

B. On completion of this work or as work progresses, the Contractor shall make all repairs and do all patching required as a result of the work under this contract. All patching shall be performed in a manner that will restore the surrounding work to its original conditions and to the satisfaction of the Owner.

C. Any cutting and patching necessary as a result of the Contractor's failure to notify the General Contractor of all the required openings, shall be at the expense of the Contractor.

3.02 OBLIGATIONS/RESPONSIBILITIES

A. The Contractor binds himself, his partners, successors, assigns and legal representatives to the Owner in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract, or sublet it as a whole without the written consent of the Architect/Owner, nor shall the Contractor assign any monies due or to become due to him hereunder, without the previous written consent of the Owner/Architect.

B. The Contractor shall supervise and direct the Work using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, safety, sequences and procedures, and for coordinating all portions of the work under his Contract.

C. The Contractor shall provide, without extra charge, all incidental items required as a part of the work, even though not particularly specified or indicated, and if he has good reason for

objecting to the use of a material, appliance, or type of construction shown or specified, he shall register his objections with the Architect/Engineer, in writing; otherwise, he shall proceed with the work under the stipulation that a satisfactory job is required.

3.03 TESTS AND INSPECTIONS

A. Schedule, obtain, and pay for all fees and/or services required by local authorities and by these specifications, to test the mechanical systems as specified in these specifications.

B. Request for Tests: Notify the Architect a minimum of 24 hours in advance of tests. In the event the Architect does not witness the test, certify in writing that all specified tests have been made in accordance with the specifications.

C. Deficiencies: Immediately correct all deficiencies which are evidenced during the test and repeat test until system is approved. Do not cover or conceal piping, equipment or other portions of the mechanical installations until satisfactory tests are made and approved.

D. Operating Tests: Upon request from the Architect, place the entire mechanical installation and/or any portion thereof, in operation to demonstrate satisfactory operation.

E. Log of Tests: The Contractor shall set up a testing log form to be kept at the job site with the record drawings. All tests shall have pertinent data logged at the time of testing. Pertinent data is to include: date, time, description, personnel, system tested (and extent), test conditions, test results, etc.

F. Completion: Upon completion of the mechanical installation, demonstrate to the Architect's satisfaction that the systems have been installed in a satisfactory manner in accordance with the plans, specifications, and applicable codes. Demonstrate dynamic operation of all systems. Show that all controls are operable and are properly adjusted in accordance with the requirements of the final systems balance, that all systems are properly balanced, that all equipment operates properly, that filters and strainers are clean, and that all components of all systems are installed and adjusted for proper operation.

1. Prior to final inspection, all work under this Division to be completed, insure all equipment is operational and final testing and balance reports have been submitted and approved.

G. Reference Cx Commissioning specifications for additional information and requirements.

3.04 OPERATING INSTRUCTIONS

A. Prior to final acceptance, instruct an authorized representative of the Owner on the proper operation and maintenance of all mechanical systems, equipment, and controls under this contract. Make available a qualified technician for each component of the installation for this instruction. Give these operation instructions after the operation and maintenance manuals have been furnished to the Owner. Submit written certification, signed by the Contractor, and an authorized representative of the Owner, that this has been completed.

3.05 COORDINATION OF WORK

A. Each Contractor shall compare his Drawings and Specifications with those of other Trades and report any discrepancies between them to the Architect, and obtain from the Architect written instructions to make the necessary changes in any of the affected work. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, all trades shall make proper provisions to avoid interferences in a manner approved by the

Architect.

B. Each Contractor shall coordinate the location of his systems so that all outside air intakes are located in such a way as to prevent cross-contamination from plumbing vents, flue pipes, exhaust fans, etc. Such a distance shall be not less than 10 feet.

C. Locations of conduit, ducts, piping, sprinkler heads and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Exact routing and location of system shall be determined prior to fabrication or installation. Coordinate routing of major electrical conduits with Electrical Contractor prior to fabrication of ductwork and piping.

D. Offsets and changes of direction in all conduit, ducts and piping systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings.

E. Where discrepancies in scope of work as to what Trade provides items, such as starters, disconnects, flow switches and the like exist, such conflicts shall be reported to the Architect prior to signing of the Contract. If such action is not taken, the various Trades shall furnish such items as part of their work for complete and operable systems and equipment, as determined by the Architect.

F. The HVAC, Plumbing and Fire Protection Subcontractors shall verify with Electrical Subcontractor the available electrical characteristics for all motors and equipment before ordering and submitting of respective gear. Verify actual connection points prior to installation and roughing-in. Mechanical and Electrical Contractor are responsible for coordination of electrical requirements and final fuse sizes of all A/C equipment. When Mechanical Contractor substitutes equipment that requires additions or upgrades to electrical system, he shall bear all costs arising from such substitutions. Reference "Mechanical/Electrical Coordination Sheet" in specifications.

G. The Contractors are to avoid routing conduit through fire rated assemblies where practical. Each trade is responsible for proper coordination of required sleeves or block-outs with rated assembly installers. Each trade is responsible for providing sleeves, as required, for his work. Each trade shall verify acceptable tolerances around penetrating item in fire assembly before beginning fire sealing.

H. Mechanical Contractor and Controls Contractor shall coordinate all requirements of equipment and controls to insure a fully operational system.

I. Coordinate all plumbing rough-in through floor(s) with structural concrete TEE's/structural steel. Do not pass through stem of TEE's.

3.06 OPERATION AND MAINTENANCE MANUALS

A. Provide one (1) Operation and Maintenance manual for training of Owner's personnel in operation and maintenance of systems and related equipment in the manner described elsewhere in these specifications. In addition, organize manuals and include data and narrative as noted below (bind each manual in a hard-backed loose-leaf binder. Use 8-1/2" x 11" white paper). Provide PDF copy of O&M for owner records

B. Operating Sequence and Procedures:

1. Contents: In each chapter, describe the procedures necessary for personnel to operate the system and equipment covered in that chapter. Also, include a copy of System Balancing Report.

2. Typewritten Operating procedures: Write procedures for start-up, operation, and shutdown.

a. Start-up: Give complete step-by-step instructions for energizing equipment, making initial setting and adjustments whenever applicable.

b. Shutdown Procedure: Include instructions for stopping and securing the equipment after operation. If a particular sequence is required, give step-by-step instruction in that order.

C. Maintenance Instructions:

1. Provide a schedule of preventive maintenance for each product. Recommend frequency of performance for each preventive maintenance task: i.e., cleaning, inspection, etc.

D. Manufacturer's Brochures: Include manufacturers' descriptive literature covering all appurtenances used in each system, together with illustrations, exploded views and renewal parts lists. Provide nearest manufacturers' representatives name, address and phone number.

E. Shop Drawings: Provide a copy of all corrected, approved submittals and shop drawings covering equipment for the project either with the manufacturers' brochures or properly identified in a separate subsection.

F. Spare Parts Lists: Include a list of all equipment furnished for project, with a tabulation of descriptive data of all the spare parts proposed for each type of equipment or system. Properly identify each part by part number and manufacturer.

G. All major Owner training sessions to be videotaped in non-pixelated video in Windows file format,

3.07 OPERATION PRIOR TO COMPLETION

A. When any piece of mechanical or electrical equipment is operable and it is the advantage of the Contractor to operate the equipment, he may do so providing that he properly supervises the operation. **All HVAC equipment shall be shut down when painting, sanding and similar construction operations detrimental to the equipment are being done.** The warranty period shall, however, not commence until such time as the equipment is operated solely for the benefit of the Owner at his request or as listed in ‘C’. Contractor shall clean any ductwork and equipment that is dirty due to equipment operation or improper protection.

B. Any units that are operated during construction shall have filter media (Fiberbond Dual-Ply DustLok Media) placed over the exterior of return air grilles. Media shall be changed as frequently as required to keep ductwork clean.

C. Regardless of whether or not the equipment has been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust the equipment and complete all punch list items before final acceptance by the Owner. The day following final acceptance by the Owner will be the start date of the warranty period.

3.08 RECORD FOR OWNER

A. Each Contractor shall accumulate and bind in an "Operating and Maintenance" manual the following data to be presented to the Owner at the completion of the Project.

1. All warranties and guarantees and manufacturer's instruction on equipment and material covered by the contract.

2. Approved equipment brochures, wiring diagrams and control diagrams.

3. Copies of approved shop diagrams.

4. Operating instructions for heating and cooling and other mechanical systems. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.

5. Repair parts lists of all major items and equipment including name, address and telephone number of local supplier or agent.

6. Valve tag charts and diagrams herein before specified.

7. HVAC balance and test results.

8. HVAC equipment start-up forms that include model and serial numbers of each piece of mechanical equipment installed, by unit mark number. For split units provide this information for all components.

9. "As-Built" Drawings as specified under "Construction Drawings" (these are not to be bound in the O&M Manual).

B. Provide reduced set of record drawing (11 x 17) indicating location and mark number of all mechanical equipment.

3.09 SITE OBSERVATION

A. Periodically, the Engineer will visit the site and review the construction progress. Field Reports will be issued noting any discrepancies or items that do not meet the intent of the contract documents found during said site visit. The contractor must answer each item listed on each field report, item by item.

B. It shall be the duty of the Contractor to personally make a careful inspection trip of the entire project, assuring himself that the work on the project is ready for final acceptance before calling upon the Owner, Architect or Engineer to make final acceptance of the work. Subsequent trips required because of Contractor's failure to do so, will be made at Contractor's expense.

C. The final acceptance of the work will be made jointly by the Architect and the Owner.

3.10 MECHANICAL/ELECTRICAL

A. **<u>THIS IS TO BE DONE PRIOR TO SUBMITTING HVAC EQUIPMENT.</u> Contractor to submit Mechanical/Electrical equipment coordination sheet with equipment submittal for actual equipment (HETD's, RTU's, AHU's, CU's, HP's, HRU's, Airhawks, AFU's, MAU's, etc) being installed. Reference chart at end of section. This is for Contractor coordination purposes.**

PROJECT NAME

PROJECT NAME

MEP/ENERGY CONSULTANTS

HENDRIX CONSULTING ENGINEERS

115 East Main Street COMMISSIONING • FIELD INVESTIGATIONS Round Rock, Texas 78664

PH: (512) 218-0060 FIRM F-4095 FAX: (512) 218-0077

PRE-CONSTRUCTION INSTRUCTION SHEET

Submittal/RFI Requirements

A. 'Individual submittals' means separate submittals with unique submittal numbers. One single giant PDF will be rejected.

B. 2 Submittal CATEGORIES (Reference Specifications)

a. Not required unless deviating from specification

b. PDF allowed.

PDF SUBMITTAL/RFI FILE TITLE REQUIREMENT:
For submittal sections listed below as allowed pdf's the following requirements must be met or the submittal will not get through email security and will be auto-deleted and not checked. Each pdf submittal must be a separate pdf file.

PDF FILE: MUST BE NAMED AS FOLLOWS:
JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION
JOB NAME – RFI No. XX – RFI DESCRIPTION

Example: Texas ISD ES No. 2 – Submittal 8 – Plumbing Fixtures
Example: Texas ISD ES No. 2 – RFI 3 – Library Light Fixture Mounting Height

EMAIL TITLE/SUBJECT REQUIREMENTS:
Emails without Job Name and proper format will not get through email security and will be auto-deleted and not checked.

JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION
JOB NAME – RFI No. XX – RFI DESCRIPTION

C. If submittals are submitted early relative to construction phasing, submittals may be held, reviewed and returned at the appropriate time for construction phasing, not necessarily 2 weeks. In some cases, if submittals are received vastly out of order of construction, submittal may be rejected.

D. Time Critical Submittal Coordination Items

Mechanical to provide to General Contractor for Structural Roof Coordination

a. Mechanical to provide roof opening shop drawing as early as possible for structural coordination. Per specifications.

Mechanical to provide to General and Electrical Contractors for Gear Coordination

b. Mechanical to complete "MECHANICAL/ELECTRICAL COORDINATION SHEET" prior to electrical gear submittals for coordination with electrical contractor. Per specifications.

E. **Do not submit non pre-approved substitutions during submittal time. These submittals will be automatically REJECTED. Substitution Pre-approval was at bid time.**

F. **Review time for multiple resubmittals of non-approved equipment will result in Contractor being billed for review time that is not part of Engineer's Scope. Engineer will bill Contractor at Engineer's Current hourly rates.**

G. **Email of all Submittals/RFI's must go directly to Architect. Do not Copy Engineer.**

H. **Engineer is not the Contractors plan reference resource. Do not submit an RFI until drawings and specifications have been reviewed first. If the answer is clearly on the drawings the response will be "The answer is clearly on the drawings, Engineer is not the Contractors plan reference resource."**

I. **Call before submitting a written RFI.**

J. **All formal Job emails must come from Architect.**

K. **Do not email send recurring jobsite meeting requests to Engineer. Engineer does not attend all weekly meetings. Architect will coordinate when Engineer is to be required at job site for specific meetings.**

Shop Drawings and Cad Files

A. Contractor Shop Drawings must use Architectural Backgrounds and Architectural RCP's (when available or lighting floorplan) and **Mechanical Contractor Shop Drawings** for coordination purposes. Do not request MEP floorplans, this will be cut and paste into an email for you to read. Engineer cannot send architectural backgrounds.

B. If no Architectural RCP is available for light locations. Lighting Floorplans will be released.

C. Mechanical Floorplan will be released to Mechanical Contractor for aid in production of his own shop drawings. HCE mechanical drawings may not be submitted as shop drawings.

D. Fire Alarm, Sprinkler, Intercom etc. all to use Architectural Backgrounds, must be obtained from Architect.

E. Schedule and Details sheets will not be released.

PROJECT NAME

MEP/ENERGY CONSULTANTS

HENDRIX CONSULTING ENGINEERS

COMMISSIONING • FIELD INVESTIGATIONS

SUBSTITUTION REQUEST

FROM: _____ DATE: _____

PROJECT: _____

RE: _____

The following has been submitted for consideration on the aforementioned project:

Specification Title, Section, Page and Article/Paragraph:

Drawings and Details Affected:

Proposed Substitution/Description:

Installer's Name:

Manufacturer's name:

☐ Point by Point Comparative Data attached - REQUIRED BY A/E (_____# of pages including cover)

Why is Substitution Being Submitted?

☐Pre-Bid Substitution (Prior Appoval): Include detailed analysis comparing proposed substitution against specified product, including redlined Specifications showing differences or deviations.

☐Specified product is not available. Explain in detail as attachment.

☐Cost Savings to Owner. Indicate comparative cost analysis as attachment.

☐Other. Explain.

Effects of Proposed Substitution?

(Attach complete explanations and technical data, including laboratory test, if applicable.) Include complete information changes to Drawings and/or Specification that proposed substitution would require for its proper installation. Fill in blanks below:

A. Does substitution affect dimensions shown on drawings? ☐No ☐Yes

B. Will undersigned pay for changes to building design, including engineering and detailing costs caused by requested substitution? ☐No ☐Yes

C. What affect does substitution have on other trades?

D. Differences between proposed substitution and specified item?

E. Indicate how proposed substitution meets LEED requirements. (if applicable)

F. Manufacturer's guarantees of proposed and specified items are:
☐Same ☐Different (explain on attachment)

The Contractor and Subcontractor certifies:
- Proposed substitution has been fully investigated and determined to be equal or superior in all respectes to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Similar maintenance service and source of replacement parts, as applicable is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted By: (name, address, telephone and contact person of manufacturer and installer of proposed substitution)

For A/E Use: SR# _____

☐Accepted ☐Accepted as Noted
☐Not Accepted ☐Received Too Late
☐Incomplete Information
☐No Substitutions Accepted
Reviewed by/date: _____
Comments: _____

Subcontractor's signature and date: _____

Contractor's signature and date: _____

COPY TO:
☐FILE ☐OWNER ☐CONTRACTOR
☐ENGINEER ☐_____

MEP/ENERGY CONSULTANTS
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115 E. Main Street
Round Rock, Texas 78664
(512)218-0060-office
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PROJECT NAME

MEP/ENERGY CONSULTANTS

HCE HENDRIX CONSULTING ENGINEERS

COMMISSIONING • FIELD INVESTIGATIONS

MECH / ELEC EQUIPMENT COORDINATION SHEET

(THIS IS REQUIRED – NOT OPTIONAL)

MARK #	UNIT TYPE	MANUFACTURER'S RECOMMENDED MOCP	VOLTAGE	PHASE	MARK #	UNIT TYPE	MANUFACTURER'S RECOMMENDED MOCP	VOLTAGE	PHASE

PROJECT NAME

END OF SECTION

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PROJECT NAME

SECTION 20 01 00 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes specific requirements, products, and methods of execution which are typical throughout the mechanical work of this project. Additional requirements for the specific systems will be found in the sections specifying those systems, and supersede these requirements.

B. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

1.02 JOB CONDITIONS

A. Obtain approval from Architect prior to cutting any structural elements or furring members.

B. Structural Interferences: Should structural members prevent the installation of piping, ducting or equipment, notify the Architect before proceeding.

C. Consider minor changes in position of equipment, piping, or ducting, as part of the contract at no additional cost to the Owner.

D. Coordinate with Structural and Architectural work to determine acceptable locations for sleeves and supports which are required but may not be specifically shown on the plans. SCHEDULE INSTALLATION OF SLEEVES AND SPECIAL SUPPORTS IN MANNER TIMELY TO THE WORK OF OTHER CRAFT. Anticipate minor offsets necessary for proper coordination with other work, and reroute systems appropriately.

E. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Civil and Electrical Drawings where such drawings affect his work.

1.03 DIMENSION AND FIT

A. Cut materials accurately from measurements taken on the JOB SITE.

B. Do not spring or bend pipe to fit conditions or make up joints.

1.04 INTERFERENCES

A. Interferences between piping and other trades shall be handled by giving precedence to pipe lines requiring grade for proper operation. Where space requirements conflict, the following order of precedence shall generally be observed.

1. Building Lines

2. Structural Members

3. Soil and Drain Piping

4. Vent Piping

5. Refrigerant Piping

6. Supply, Return, O/A Ductwork

7. Exhaust Ductwork

8. Chilled and Hot Water Piping

9. Domestic Hot and Cold Water Piping

10. Natural Gas Piping

11. Electrical Conduit

12. Fire Protection Piping

1.05 SERVICEABILITY OF PRODUCTS

A. Furnish all products to provide the proper orientation of serviceable components to access space provided.

B. Coordinate installation of piping, ductwork, equipment, coils, system components, and other products to allow proper service of all items requiring periodic maintenance or replacement.

C. **Replace or relocate all products incorrectly ordered or installed to provide proper serviceability.**

1.06 ACCESSIBILITY OF PRODUCTS

A. Arrange all work to provide permanent, convenient, and safe access to all serviceable and/or operable products. Layout work to optimize net usable access space within confines of space available. Advise Architect, in a timely manner, of areas where proper access cannot be maintained. Furnish layout drawings to verify this claim, if requested.

B. Provide access doors in ceilings, walls, floors, etc., for access to traps, valves, dampers, automatic devices, and all serviceable or operable equipment in concealed spaces. Location of panels shall be submitted for approval in sufficient time to be installed in the normal course of work.

1.07 ROUTING

A. Route all pipelines and ductwork parallel with building lines, and as high as possible, except where under ground or shown otherwise on the plan.

B. Route piping and ducts to clear all doors, windows and other openings, and to avoid all other pipes and ducts, light fixtures, and similar products.

C. Conceal all pipes and ducts where routed through finished areas, unless authorized by Architect or otherwise indicated on plans.

PART 2 - PRODUCTS

2.01 MATERIAL PRODUCTS

A. Provide all products new, unused, and undamaged, of standard manufacture, and of latest design and best quality. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113. ALL PAINTS MUST MEET VOC LIMIT OF GREEN SEAL ENVIRONMENTAL STANDARD GS-11. ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

B. When a manufacturer's name appears in these specifications or schedule, it is not to be construed that the manufacturer's material does not have to meet the full requirements of the specifications or that his standard catalogue item will be acceptable.

C. All equipment installed on this project shall have local representation, local factory authorized service and local stock of repair parts.

D. All materials exposed within a plenum shall be noncombustible or shall have a flame spread index of not more than 25, and a smoke developed index of not more than 50, when tested in accordance with ASTM E 84.

2.02 Where more than one type of material (i.e., cast iron or PVC) is specified, the Contractor may choose one type; however, he must state which type of material he proposes to use in his submittal. ONLY ONE TYPE OF MATERIAL MAY BE USED IN A SPECIFIC PIPING SYSTEM, UNLESS SPECIFICALLY NOTED OTHERWISE. (I.E. WHEN DIFFERENT SIZES OF THE SAME TYPE SYSTEM REQUIRE DIFFERENT MATERIALS PER SPECIFICATIONS.)

2.03 PIPE AND FITTINGS

A. Steel Pipe: **All steel piping and fittings are to be domestically manufactured (USA).**

1. PROVIDE DOCUMENTATION IN SUBMITTAL STATING LOCATION OF MANUFACTURING.

2. Threaded: Schedule 40, ASTM A53 grade B or ASTM A120, American Standard pipe thread. Pipe 2" and under to be made up with threaded fittings.

3. Welded: Schedule 40 black, ASTM A53 grade B or ASTM A120, ANSI B16 butt weld fittings of type and wall thickness to suit pipe. Weld-O-Lets and Thread-O-Lets may be used on pipe 2-1/2" and larger where branch is a minimum of two pipe sizes smaller than main. Pipe 2-1/2" and over to be made up with welded fittings. Pipe 2” and under to be made up with threaded fittings.

4. Grooved Pipe: Schedule 40 ASTM A120 or ASTM A53 grade. Standard cut or rolled groove to coupling manufacturer's specifications. Do not use in systems exceeding 200^{O} F. operating temperature.

a. Couplings: Standard weight with gasket selected by manufacturer for service intended.

b. Fittings: Full flow malleable iron, ductile iron or steel.

c. Submit calculations of expansion allowance of joints and obtain approval prior to eliminating any special expansion compensators, swing joints, flexible connections, or vibration isolators.

d. Manufacturers: Victaulic, Gruvlok or Apollo.

5. Press fit: Use Viega Mega Press or equal by Apollo.

B. Copper pipe:

1. Type "K" or "L" hard drawn copper with wrought copper fittings with openings machined to accurate capillary fit for the pipe. Pipe to conform to Standard Specifications for copper water tube. Type 'M' may only be used for A/C condensate drain lines.

2. Use "lead free" (0.00% lead content) solder for all domestic water piping. Submittal on the product to be used must include this information. Lead free solder to conform to ASTM B 32 and flux to conform to ASTM B 813. Soldered joints must be done in accordance with ASTM B 828. Lead free shall mean a chemical composition equal to or less than 0.2 percent lead.

3. Solder joints using 50/50 lead tin solder for systems operating below 180^{O} F.

4. Solder joints using 430 silver solder for systems operating at 180^{O} F. or above.

5. Press fit joints using Viega, Apollo or equal press fit fittings.

C. Domestic Copper Pipe (2" and larger): (Contractor Option)

1. Copper tubing systems from two inches (2") through six inches (6") shall be installed using mechanical pipe couplings of a bolted type with a central cavity design pressure-responsive gasket along with grooved end copper fittings.

2. All copper tubing shall be prepared in accordance with the manufacturer's published specifications.

3. Couplings - Coupling for copper shall consist of cast ductile iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design, with nuts and bolts to secure unit together.

a. Housings - Shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12) with a copper alkyd enamel paint coating.

b. Gasket - Gaskets shall be molded of synthetic rubber in a central cavity, pressure-responsive configuration conforming to the copper tube size (CTS) outside diameter and coupling housing, of elastomers having properties as designated in ASTM D-2000.

c. Water Service - Gaskets supplied for water services from -30^{O} F to +230^{O} F shall be a Grade "E" EPDM compound, with copper color code, molded of materials conforming to ASTM D-2000, designation 2CA615A15B44F17Z, recommended for hot water service within the specified temperature range.

4. Flanged Connections: Shall be engaging directly into roll grooved copper tube and fittings and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components; installer to supply standard flange bolts. Flange casting shall be as in 3, a. above with a corresponding gasket as in 3, b.

5. Fittings - Fittings shall be full flow copper fittings with grooves designed to accept grooved end couplings.

a. Standard fittings shall be two inch (2") through four inch (4") copper per ASTM B-75 alloy C12200; five inch (5") through six inch (6") bronze sand castings per ASTM B-584-87 copper alloy CDA 844 (81-3-7-9).

6. Butterfly Valves – Lug style, grooved end butterfly valves are to be rated for bi-directional dead end service to the full working pressure of the valve with the down stream flange removed.

a. 2 ½-6" valves shall have either lever lock handles or gear operators. Valves in 2 ½" or 3" sizes may have two-position handle as per service requirements and manufacturer's recommendations.

1) Valve housing shall be bronze per CDA-836 (85-5-5-5).

2) Disc shall be aluminum bronze or ductile iron.

3) Operator bracket shall be steel-black enamel coated.

4) Operator - Two (2) position detent or manual lever lock shall be steel-black enamel coated.

5) Seat to be molded to the body of the valve for bi-directional dead end service

7. Tube Preparation: Copper tube shall be ASTM B-88 (drawn tubing) and prepared in accordance with the latest published manufacturer's specifications, as applicable. Pressure ratings and end loads for roll grooved copper tubing are based upon test on copper tube prepared in accordance with manufacturer's specifications using manufacturer's approved rolled grooving tool for grooving copper tube.

8. Assembly: Couplings, fittings, adapters and tubing shall be assembled in accordance with the latest published instructions from the manufacturer for the particular product installed.

9. Reference hanger spacing in specification. In addition, use the following recommendations for support installation:

a. Copper tubing joined with grooved type couplings requires support to carry the weight of tubing and equipment. The support or hanging method must be such as to eliminate undue stresses on joints, tubing and other components.

b. The support system for mechanical grooved type tubing couplings must consider some of the special requirements of these couplings.

D. Compressed Air Piping:

1. Piping to be Schedule 40 black steel pipe. All piping 2" and smaller may be TYPE "K" hard drawn copper pipe, at contractors' option.

2. Use capped tees at each joint facing up to allow for future connections. All connections to be made with tees facing up.

3. Slope all piping to drain. Provide drain leg at each low point with ball valve at bottom of drain leg for draining system. Drain leg to be approximately 7'-6" A.F.F. (verify in field).

4. Install Metal-Flex flexible connector near compressor outlet equal to Amber/Booth type SS-PM.

2.04 VALVES

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 psig steam or 150 psig W.O.G. All valves on insulated lines to have extended handles to allow operation without disturbing insulation seal.

B. Manufacturer: Nibco, KITZ, Jenkins, Milwaukee, Stockham, Apollo or other recognized manufacturer of equal reliability.

C. Gate Valves, 2½" and Larger: Iron body, bronze trim, rising stem, flanged.

D. Globe Valve 2" and Smaller: Teflon disc, bronze body, bronze trim.

E. Ball Valves 3" and Smaller: Brass or bronze body, virgin TFE seat rings, blow-out proof stem, reinforced thrust washer, ¼ turn full open/full close, FULL PORT, CSA-ULFM approval.

F. Globe Valve 2½" and Larger: Iron body, bronze trim, Buna-N disc, flanged, bronze disc hot water, Buna-N disc cold water.

G. Swing Check Valves 2" and Smaller: Bronze body, horizontal swing, Y-pattern, renewable disc.

H. Swing Check Valves 2½" and Larger: Iron body, horizontal swing, bolted bonnet, renewable seat and disc, flanged, non-slam type.

I. **Butterfly Valves: Reference Section 2.03, C. above.**

J. Drain Valves: Hose end gate valve or gate valves with hose connection. Do not use sillcocks in lieu of drain valves.

K. Valves Specified Elsewhere: Provide special valves such as motor operated valves, relief valves, temperature regulating valves, etc., as specified under the individual system or as indicated on the drawings.

L. USE FULL PORT BALL VALVES RATED FOR SERVICE INTENDED FOR ALL ISOLATION VALVES THREE INCHES (3") AND SMALLER.

2.05 BALANCING VALVES

A. Provide balancing valves for all cooling and heating flows and at all pump discharge lines. Provide balancing valves for all potable hot/tempered water recirculation systems and at TMV’s as required by manufacturer’s written instructions.

B. Valves sized for maximum 1 pound pressure drop at design flow with valve wide open. Submit schedule of balancing valves indicating sizes, flow ranges and pressure drop curves.

C. Valves, rated at not less than 150 psi, furnished with three self-lubricating bronze or teflon-coated stainless steel bushings with shaft seals at each bushing; seals to be hard back resilient type and shall be field replaceable; discs shall be bronze, aluminum-bronze, or semi-steel with welded nickel edge.

D. Valves 4" and smaller insulated with removable foam polyurethane Dry Cap. Series 400.

E. Valve 2½" through 6" shall be lever operated. Butterfly valves, lug body indicating locking type with adjustable memory stop, may be used at Contractor's option at each location where gate valves or globe valve is indicated on water line 2½" and larger.

F. On valves 2" and smaller, use Flow Set balancing valves system consisting of: 300 lb. rate flow measuring bronze body ball valve with integral venturi and temperature and pressure taps; flow setting 300 lb. butterfly valve assembly with stainless steel disc and Viton seats dual-core temperature/pressure test port and external lockable memory stop. Furnish valves with insulation sleeve for ease of access to temperature/pressure ports and to allow adjustments of valve handles without removing insulation. Manufacturer: FlowSet by Olympic Valve, Inc. At the Contractor's option, use Presso B-Plus balancing valves with extension handle and extension P/T plugs.

G. Manufacturers: DeZurik, Olympic Valve, Inc., Jenkins, Nibco, B & G, Hammond, Presso, Apollo or approved equal.

2.06 UNIONS

A. Provide unions adjacent to all tanks and equipment and where required for disconnect and maintenance of equipment.

B. Union for Steel Pipe: Ground joint malleable iron.

C. Union for Copper Pipe: All brass.

D. Union Between Dissimilar Metals: Dielectric Union designed and advertised to be unaffected by heat, cold or fluid in pipe. EPCO or approved equal.

2.07 MISCELLANEOUS

A. Escutcheons: Nickel or chrome plate with screws or springs for holding plate in position.

B. Automatic Air Vents: Hoffman #79, Marsh or equal.

C. Gaskets: Gaskets 1/16 inch thick for all pipe sizes 10 inches and smaller, and 1/8 inch thick for all pipe sizes 12 inches and larger. Gaskets to be ring type between raised face flanges and full face type between flat face flanges with punched bolt holes and pipe opening. Gasket material shall be suitable for the service intended and shall be installed as recommended by the manufacturer. Manufacturer: Crane, John-Manville, or equal.

D. Strainers: Cast iron or bronze body basket or wye type strainers provided with ½" valved drain and a ¼" air vent cock, unless the strainer design is devoid of air pockets. Strainers shall have removable cylindrical or conical screens of nickel, copper, or brass and suitable flanges or tappings to connect with the piping they serve. Strainers 2½" and larger shall be provided with flanged covers. The free area of each screen shall not be less than three (3) times the area of the strainer inlet and shall be suitable for the service intended. Manufacturers: Crane, McAlear, Sarco or Armstrong.

2.08 MECHANICAL SUPPORTING DEVICES

A. General:

1. Securely fasten all mechanical work to the structure to prevent hazard to human life and limb, and to prevent damage to products of construction under all conditions of operation.

B. Pipe Supports:

1. Single Pipes:

a. Support all horizontal runs of steel, copper pipe under 2" and all cast-iron soil pipe on suitable hangers spaced not more than 5 feet on centers. Support all steel, and copper piping 2" and larger not more than 10 feet on centers. Support all PVC piping not more than 4 feet on center. Support piping in a manner to prevent binding, undue swing, and the transmission of vibration to the structure.

b. Support single pipes from clevis hangers equal to Anvil fig. 260. Install hangers for insulated piping outside the insulation using high density section of insulation and sheet metal shield or saddle. Provide copper plated hangers in contact with copper pipe.

2. Trapeze Hangers: Where pipes are clustered, parallel, and in same plane, they may be supported by trapeze hangers. Provide rods and angle-irons sized to suit load imposed. Minimum channel length to be six inches (6"); maximum rod spacing to be twenty-four inches (24") on center. Piping to be securely attached to trapeze hangers. Provide sheetmetal shield or saddle for all insulated piping running horizontally.

3. Piping on Walls: Secure with hook-plates, clips or fabricated steel brackets.

4. Supports from Steel Beams and Similar Construction: Use appropriate beam clamps.

5. Provide inserts for poured concrete and expansion bolts for pre-cast slabs.

6. Guide and anchor piping where necessary to control expansion and contraction. Provide supports and hangers with non-corrosive and rust-resistant finish. Galvanize or plate hanger rods after threading. Hangers other than those specified not permitted. **USE ONLY GALVANIZED HANGERS AND HANGER RODS FOR ALL PIPING IN CRAWL SPACE.**

7. Provide inserts for poured concrete and expansion bolts for pre-cast slabs. Use HiltiDrop-in Anchor or Kwik Bolt II Stud Anchor System. Verify allowable place of anchors with Structural Engineer.

8. Provide pipe supports according to the following schedule:

PIPE SIZE - INCHES	ROD SIZE - INCHES
½" through 2"	3/8"
2½" through 3"	1/2"
4" through 6"	5/8"
8" through 12"	3/4"

9. Manufacturers: Anvil International, C&P, Fee and Mason, Elcen or SuperStrut.

C. Support all piping on roof with pipe stands/roller equal to MIRO Industries Model 4-RAH-PC or Portable Pipe Hangers, Inc., Type PP10 with roller for piping 2-1/2" and smaller. For piping over 2-1/2", up to and including 8", use MIRO Industries Model 6-RAH-PC or Portable Pipe Hangers, Inc. (PPH) Type PS-1-2. All pipe stands to sit on walk board (coordinate type and methods of support with Roofing Contractor). Walk board to be a minimum of 3" larger on each side than support. Provide minimum pipe height above roof deck as required by jurisdiction having authority (at least 6"). Provide supports for piping under 2" at six feet on center. Provide supports for piping 2" and over at eight feet on center. **PIPE PROP will not be acceptable.**

D. Ductwork Support: Refer to Section 23 30 00-Air Distribution.

E. Inserts: Provide all inserts required for installation of horizontal piping. In poured concrete provide wrought steel or malleable iron and adjustable type. Where expansion bolts are necessary to secure piping or equipment, use malleable iron type with expansion case, to be inserted by drilling concrete. Power driven inserts not permitted for supporting piping to ceiling.

F. Miscellaneous Iron and Steel:

1. Provide all steel supports and hangers to support all equipment or materials unless noted otherwise.

2. All work shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets and framework shall be properly sized and rigidly constructed in a manner to withstand anticipated loads.

3. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be performed by experienced metal-working mechanics. Members shall be straight and true and accurately fitted.

4. Welded joints shall be ground smooth where exposed. Drilling, cutting and fitting shall be done as required to properly install the work and accommodate the work of other Trades.

5. Members shall be generally welded, except that bolting may be used for field assembly where welding would be impractical. Welders shall be skilled and certified.

6. All shop fabricated iron and steel work shall be cleaned and dried and given two (2) coats of weatherproof primer paint on all surfaces and in all openings and crevices.

2.09 ACCESS DOORS

A. Doors shall be Karp, Inland Steel Products, Milcor, Miami or Walsh-Hannon, constructed of steel with primer coat of rust inhibitive paint, and continuous piano hinge. Doors shall be key operated with flush operated cylinders, keyed alike. Key lock system shall be coordinated with the Owner and shall be approved by the Architect. Provide six (6) keys of type used for access panels for Owner's use. Obtain receipt of key delivery and submit to Architect for record.

1. Suspended Lath and Plaster Ceilings - Style: "M" with 16 gauge frame, 14 gauge panel.

2. Masonry Non-Rated Walls - Style: "M" with 16 gauge frame, 14 gauge panel.

3. Masonry Fire Rated Walls - Fire rated with UL, ½ hour "B" rating, 16 gauge frame, 20 gauge sandwich type insulated panel.

4. For access doors larger than 16" in either direction, provide two (2) locksets.

2.10 CHIMNEY SYSTEMS

A. Type B Vent:

1. Factory-built; labeled and tested for use with building heating equipment.

2. Double wall pipe; galvanized steel outer pipe, heavy gauge aluminum inner pipe.

3. Supply with support pieces, adapters, fittings, ventilating thimble and Type MC wind cap.

4. Provide vent and cap for all gas consuming equipment. Verify all sizes with actual equipment purchased. In no case shall the pipe be smaller than the equipment connection size.

B. Type “B” Vent Pipe Manufacturers: Metalfab, Metalabestos or equal.

C. PVC/CPVC Vent/inlet:

1. Provide minimum schedule 40 solid core PVC/CPVC combustion air intake and/or flue exhaust vent as required for all condensing type water heater(s)/furnace(s) installed and sized as required by manufacturer’s written instructions. Wrap all piping exposed to plenum spaces with products to meet 25/50 smoke/flame requirements. Terminate with products per manufacturer’s written instructions.

PART 3 - EXECUTION

3.01 EQUIPMENT MOUNTING

A. Provide equipment concrete pads, treated support runners, roof curb supports, mounting accessories, supports, hanger expansion joints, adapters and any other appurtenances to adapt fixtures and equipment supplied to the conditions of use.

B. Provide vibration eliminators as specified (if not specified elsewhere use vibration eliminators recommended by equipment manufacturer) at all pieces of equipment subject to vibration. (Exception; curb mounted equipment does not require vibration isolator rails except when specifically scheduled).

C. Independently support piping and ductwork at equipment so that no weight is supported by the equipment.

D. Securely fasten fixtures and equipment to the building structure in accordance with manufacturer's recommendation.

E. Provide steel base plates for floor mounted fixtures and equipment to distribute the weight so that the floor load is not more than 100 lbs. psf, unless special structural reinforcement is submitted for approval.

F. At wall attached fixtures and equipment weighing less than 50 pounds, provide backing plates of at least 1/8 x 10 inch sheet metal or 2 x 10 inch fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.

G. Electrical conduit shall not be hung from equipment or plumbing piping.

3.02 SLEEVES

A. Provide sleeves as required where pipes pass through walls, floors, or ceilings. Make sleeves as follows:

1. In non-fire rated bearing walls, foundations, masonry or concrete walls and floors, use schedule 40 black steel pipe.

2. In non-rated construction, use minimum 20 gauge galvanized sheetmetal.

3. In fire rated walls, floors and assemblies, install sleeves as required by UL System Number.

B. In non fire rated areas install sleeves flush with surfaces. In mechanical rooms or any wet floor where seepage may occur, install sleeve 1 inch above floor and caulk. Caulk both sides of penetration using UL listed one part firestop synthetic elastomer sealant, flexible at normal working temperatures, having smoke developed 50, fuel contributed 50, and flame spread 25 rating. Install thickness per manufacturer's recommendation. Manufacturer: Dow Corning FireStop 2000 Sealant, Flame Stop V, 3M: CP-25.

C. Waterproof all piping and sleeves through building exterior skin, including walls, roofs and interior floor penetrations to prevent leakage. Coordinate with the Architect on caulk material to use at exterior.

D. Size sleeves for cold piping to allow for continuous insulation through sleeve.

3.03 SEALING AND FIREPROOFING

A. SEALING OF PENETRATIONS THROUGH RATED WALLS, FLOORS, CEILING AND ROOF ASSEMBLIES SHALL BE INSTALLED PER UL "FIRE RESISTANCE DIRECTORY." UL SYSTEM NUMBERS INDICATED ARE FOR A PARTICULAR LISTED INSTALLATION AND ARE FOR GENERAL INFORMATION AND INTENT. OTHER LISTED UL SYSTEM DESIGNS MAY BE USED. IN ALL CASES, SUBMIT MATERIALS, UL SYSTEM DESIGN NUMBERS AND UL DETAILS TO BE USED THROUGHOUT THE PROJECT AND IDENTIFY WHICH DETAIL IS TO BE USED FOR EACH SPECIFIC CONDITION. POST REVIEWED DETAIL AT JOB SITE FOR REFERENCE.

1. Only materials tested in the specific UL System Number may be used.

a. Wrap Strip (UL System No. WL 5001): Nominal 1/4" thick by 2" wide intumescent elastomeric material. Manufacturer: 3M Type FS-195.

1) Use one (1) wrap strip for up to one inch (1") thickness insulation.

2) Use two (2) wrap strips for 1-1/2" inch and larger thickness insulation.

b. Caulk Manufacturer:

1) 3M Type CP-25 WB+ for all assemblies requiring 3M caulk.

2) For WL3045 and 3046 use Hilti FS611A Sealant.

c. Steel Sleeve (Stud Wall) (UL System 1003): Cylindrical sleeve shall be fabricated from minimum 0.019" thick (no. 28 gauge) galvanized sheet steel and having a minimum 2" lap along the longitudinal seam. Length of steel sleeve to be equal to thickness of wall plus 1" such that, when installed, the ends of the sleeve will project approximately ½" beyond the surface of the wall on both sides of the wall assembly. The diameter of the openings cut on each side of the wall assembly (concentric with pipe) to be 2 to 2-1/2" larger than the outside diameter of pipe, such that when the steel sleeve is installed, a 1 to 1-1/4" annular space will be present between the steel sleeve and the pipe around the entire circumference of the pipe. Install sleeve by coiling the sheet steel to a diameter smaller than the through opening, inserting the coil through the openings and releasing the coil to let it uncoil against the circular cutouts in the gypsum wallboard layers.

d. Steel Sleeve (Concrete or Block Wall): For cables, provide sleeve cast in floor/wall or mortared into CMU wall; optional sleeve for UL System No. CAJ1175.

e. Forming Material: Minimum one inch (1") thickness mineral-wool batt insulation material. Tightly pack into sleeve with minimum 1/2" recess on ends. Manufacturer: Thermafiber Safing Insulation.

2. Wire/Cables:

a. For Gypsum Frame Wall (Single Cable): Fireproof per UL System No. WL3001. Opening for cable to be hole-sawed through gypsum wall board layers. Diameter of opening to be 3/8" to 5/8" inch larger than outside diameter of cable. Cable to be rigidly supported on both sides of wall assembly. Caulk to fill annular space throughout thickness of gypsum wall board layers and apply 1/4" bead of caulk to perimeter of cable at its egress from wall (both sides).

b. For Gypsum Frame Wall (Multiple Cables): Use UL System No. WL3021, WL3045, WL3046 or equivalent to maintain rating of wall.

c. For Concrete Walls/Floors or CMU Walls (Single or Multiple Cables): Fireproof per UL System No. CAJ3030. Cables to be a minimum ten percent (10%), maximum thirty-three percent (33%) of cross-sectional area of opening. Recess minimum one inch (1") thickness of mineral wool material into opening around cables. Caulk openings around cable to minimum depth of one inch (1"). Optional sleeve may be used per UL detail requirements.

3. Firestop system shall be installed at top surface of floor and symmetrically on both sides of wall assemblies.

4. Materials used in firestop systems shall be installed in accordance with the manufacturer's instructions, provided with materials for specific UL System Number.

5. Reference Architectural for the exact location of all rated walls, floors, ceilings and ceiling/roof assemblies.

B. Manufacturers: 3M, Metacaulk, Hilti, BioFireshield, STI or equal.

C. In non-rated walls identified for sound insulation, provide 1/2" space between pipe and sleeve packed with multiple layers of forming material. Allow 5/8" minimum space on each side and caulk with acoustical sealant.

D. **Final condition to prevent passage of fire, smoke, noxious gas and water.**

E. For non-rated mechanical/electrical room walls: Seal all piping and ductwork passing through walls, floors and ceilings with 3M caulk, Type CP-25+.

F. Submit UL numbers and details for type of penetrations and materials to be used. All penetrations in fire rated walls, floors and ceilings must be installed per a UL listed detail specified for the application.

G. **Seal both sides of all floor penetrations into crawl space on both sides to prevent air and water migration.**

3.04 WATERPROOFING AND COUNTERFLASHING

A. Provide and install all counterflashing of all conduit, pipe or duct and equipment which penetrates roofs, walls and other weather barrier surfaces. Metal Roofing Contractor shall provide and install all curbs and counter flashing for all metal roof penetrations. Verify detail with Architect before installation.

B. All work shall be performed in a workmanlike manner to assure weatherproof installation. Any leaks developed shall be repaired at contractor’s expense, to Architect's satisfaction.

C. Conduits, pipes or ducts passing through slabs shall have the sleeve extended above floors to retain any water and the space between the conduit, pipe or duct and sleeve caulked with lead wool. The top shall be sealed with lead and the bottom shall be sealed with monolastic caulking compound.

D. All waterproofing, flashing and counterflashing shall be provided and installed by the Roofing Contractor and shall be compatible with roofing system so as not to void any roof warranties. Confirm installation with Architect.

E. Slope all ducts to wall louvers to drain toward louvers. Provide continuous sleeve thru wall and seal all joints.

F. All piping and conduit penetrations through exterior walls shall be sealed on both side of drain plane and at exterior finished wall surface to prevent moisture intrusion.

3.05 LABELING AND TAGGING

A. Tag all valves with minimum 1/16" thick heat resistant laminated dark plastic labels engraved with readily legible white lettering 1/4" high indicating fluid in pipe and a “V” (valve) number (e.g. V-22). Securely fasten to the valve stem or bonnet with beaded chain. Provide an aluminum valve chart and frame with glass cover for typewritten valve chart. Install where directed. Coordinate valve numbers with mechanical contractor to avoid duplication. Refer to Section 20 00 00, and Manuals.

B. Label all equipment with minimum 1/16" thick heat resistant laminated plastic labels having engraved lettering 1/2" high and fastened in place with rivets, screws or adhesive backing. Example "WH-1, AHU-1, etc." If items are not specifically listed on the schedules, consult the Architect concerning designation to use. Refer to Section 20 00 00. Label all equipment served by emergency electrical panels with red labels.

C. Label all thermostats/sensors with minimum 1/16" thick heat resistant laminated plastic labels having engraved lettering 1/4" high and fastened in place with rivets, screws or adhesive backing. Label is to correspond to rooftop and/or air-handling units.

D. Provide access panel markers (minimum 1/16" thick laminated plastic type with engraved lettering) to indicate ceiling tile to be used for access for all A/C equipment, terminal units and plumbing shut-off valves. Use light green for plumbing and light blue for A/C equipment. Label to be attached to ceiling grid with rivets, screws or adhesive backing. Example, “AHU-3A” access.

E. Manufacturer: Seton Pipe Marking Products, MSI (Marketing Services, Inc.) or equal.

3.06 TYPICAL PIPING

A. Provide insulating couplings or unions to prevent electrolysis between dissimilar metals when use of dissimilar metals cannot be avoided in one system.

B. Close all openings in pipes with appropriate caps, plugs, or covers during storage and progress of the work to preclude introduction of contaminants.

C. Arrange systems and locate valves so that either entire system or separate sections thereof may be drained for service. All service valves located no more than 24 inches above the ceiling and normally accessible from an 8 foot ladder.

D. Provide valves and unions adjacent to all tanks, batteries of plumbing fixtures and equipment, for disconnect purposes. Install all valves with stems vertical wherever possible, and in no case with stems below the horizontal.

E. Ream ends of all pipe to full diameter.

F. Provide pipe anchors, swing joints, and expansion compensators as required to control the expansion of pipelines.

G. Reduce pipe sizes using reducing tees or reducing fittings. Bushings not permitted except on tanks and similar equipment.

H. Provide escutcheons on all pipes passing through walls, floors, and ceilings in finished areas where piping is in counters, closets or cabinets, and subject to view when doors are open. Cover the pipe sleeve and secure plate in position.

I. Install hangers at each change in direction, and within 2 feet at each elbow or tee. This requirement is mandatory.

J. Pipe hooks, wire, chains or perforated metal shall not be used for pipe supports.

K. Insulate hangers for copper pipe from piping with at least two layers of 12 mil Polyken 826 corrosion control tape.

L. Install piping not to interfere with removal of equipment, ducts and devices or block access to door or access openings.

M. Piping serving plumbing fixtures and equipment shall be securely supported near the point where pipes penetrate the finished wall.

N. Test all piping in accordance with accepted trade standards if not specified elsewhere.

3.07 THREADED PIPE

A. Cut all threads true and of depth to make up properly without leaks.

B. Make connections to show at least two threads and not more than four threads when tight.

C. Make up joints with Teflon tape only as recommended by tape manufacturer, or as specified in specific piping sections.

3.08 AUTOMATIC (MANUAL) AIR VENTS

A. Install at highest point of chilled and hot water system, at chilled and hot water coils and at points necessary to relieve air in piping. Provide shut-off valve to facilitate maintenance of air vent.

B. Route 1/4" copper line from discharge of air vent to floor drain in mechanical room. Slope to drain.

3.09 PAINTING AND CODING

A. Ductwork and Piping: Prime and paint all exposed angle braces, hanger rods or straps, damper rods, and quadrants with one coat aluminum paint after removing scale and rust. Prime and paint ductwork and piping exposed in finished rooms to match room finish. Prime and paint all black iron piping located outdoors or otherwise exposed to weather. Coordinate painting and color with Architectural paint specified elsewhere. All painting done by persons regularly employed at and skilled in that trade.

B. Grilles, Registers, Etc.: Furnish all grilles, registers, etc., other than extruded aluminum or plastic, with prime coat paint by manufacturer. Furnish all ceiling grilles, registers and diffusers with factory applied baked enamel to match ceiling tile. Paint all ductwork and/or conduit visible through registers, grilles and other openings with one coat of flat black paint to a point four feet (4') from opening on straight duct or around bend, whichever applies.

C. Pipe Coding:

1. Identify piping with pressure-sensitive coded pipe marker at piping adjacent to equipment, at intervals along all piping not to exceed 20' and at points where piping disappears into or emerges from floors, walls or ceiling. Secure both ends of marker with pressure sensitive tape with flow arrow on roll to indicate flow direction. Color code pipe markers and arrows indicating the liquid and/or use of the pipe.

2. Code piping to the following schedule: (SUBMIT ALTERNATE CODING)

Cold Water	CW
Hot Water	HW
Hot Water Circulating	HWC
Chilled Water Supply	CHS
Chilled Water Return	CWR
Hot Water Supply	HWS
Hot Water Return	HWR
Gas	FUEL GAS
Heat Pump Supply	HPS
Heat Pump Return	HPR
Condenser Water Supply	CWS
Condenser Water Return	CWR

Sprinkler	SPKR
Condensate	Condensate
Tempered Water	T

3. Manufacturers: Seton Pipe Marking Products, MSI or equal.

END OF SECTION

PROJECT NAME

SECTION 20 07 00 - INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description:

1. This section describes specific requirements, products and methods of execution which relate to the insulation of ducts, pipes and other surfaces of the mechanical installation.

2. Insulation is provided for the following purposes:

a. Energy conservation

b. Control of condensation

c. Safety of operating personnel

B. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

C. Acoustical Lining Insulation Summary

1. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for correct fabrication and installation of air duct systems of sheet metal lined with fibrous glass duct liner, in accordance with applicable project drawings and specifications, subject to terms and conditions of the contract:

2. All air duct systems operating at internal air velocities not exceeding rated duct liner limitations as listed below and internal air temperature not exceeding 250°F (121°C).

3. Duct liner products shall conform to the requirements of ASTM C1071. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

4. The manufacturer’s product identification shall appear on the air stream surface.

5. Duct liner adhesive shall conform to the requirements of ASTM C 916. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

6. The finished duct system shall meet the requirements of NFPA 90A and 90B.

7. Duct dimensions shown on the plans are finished inside dimensions.

8. Fabrication and installation shall conform to the requirements of the latest edition of the North American Insulation Manufacturers Association's *Fibrous Glass Duct Liner Standard* (hereinafter referred to as NAIMA FGDLS) or the Sheet Metal and Air Conditioning Contractors National Association *HVAC Duct Construction Standards - Metal and Flexible* (hereinafter referred to as SMACNA HVAC DCS) or the manufacturer's recommendations.

D. References

1. American Society of Testing and Materials(ASTM)
    a. ASTM C1071
    b. ASTM C916
    c. ASTM G21
    d. ASTM G22
    e. ASTM C423
    f. ASTM C518
2. National Fire Protection Association (NFPA)
    a. NFPA 90A
    b. NFPA 90B
    c. NFPA 259
3. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
    a. HVAC Duct Construction Standards Metal and Flexible (HVAC DCS)
4. North American Insulation Manufacturers Association (NAIMA)
    a. Fibrous Glass Duct Liner Standard (FGDLS)
5. International Nonwovens & Disposables Association (INDA)
    a. IST 80.6

E. Delivery, Storage and Handling

1. Deliver all materials and/or fabricated insulated duct sections and fittings to the job site and store in a safe, dry place.
2. Protect materials from dust, dirt, moisture, and physical abuse before and during installation, startup and commissioning. Wet or contaminated duct liner shall be replaced.

PROJECT NAME

PART 2 - PRODUCTS

2.01 FIRE RATING OF MATERIALS

A. Provide all insulation products used above ground in buildings with burning characteristics not to exceed the following ratings according to NFPA 255-1972 “Method of Test of Surface Burning Characteristics of Building Materials”: Flame Spread 25, Fuel Contributed 50, Smoke Developed 50.

B. Insulation specified for use underground and above ground away from the building, might have other burning characteristics. Use such products only where specifically required.

2.02 INSULATION

A. TYPE "A": Pre-molded Fiberglass Piping Insulation:

1. Jacketed Type:

a. Thermal conductivity K = 0.24 at 100^{O} F. mean temperature.

b. Factory applied kraft-reinforced vapor barrier flame retardant all service jacket and tape, with permeability rating - 0.02 perms. All service jacket with polymer film exterior surface that is smooth, durable, cleanable, wrinkle resistant, resists water staining and that does not support mold or mildew growth.

c. Provide insulation sections with self-sealing pressure sensitive adhesive on both overlap seam and mating jacket surface.

d. Fitting insulated with pre-cut insulation inserts covered with PVC fitting cover properly vapor sealed.

e. Manufacturer: Owens-Corning Fiberglass SSL II with ASJ Max or equal product by: Knauf (**NO MANSON**) or Manville with WMP-ASJ jacket.

2. Secondary Jacket (This goes on over properly sealed standard WMP-ASJ jacketing) All piping run within unconditioned indoor spaces such as Mechanical Room and Crawl Space or ventilated attic spaces):

a. PVC jacket Shall be used in <u>all</u> mechanical/boiler rooms for all insulated piping to within two inches (2") of interior wall surface of mechanical/boiler rooms. This includes all satellite mechanical rooms containing air handlers.

b. One (1) piece “hinged” construction.

c. **Entire piping system in mechanical rooms is to be covered with high-impact, UV-resistant polyvinyl chloride jacketing with gloss white finish.** Properly seal all joints. Follow manufacturers written installation instructions.

d. ALL Fittings to be insulated with pre-cut insulation inserts and are to be covered with PVC fitting cover.

e. All piping in Unconditioned spaces other than mechanical rooms are to be wrapped with mold resistant Polyguard ZERO-PERM vapor barrier membrane. Properly seal all joints. Follow manufacturers written installation

instructions.

B. TYPE "B": Cellular Piping Insulation:

1. Thermal conductivity K = .27 @ 75^{O} F. mean temperature.

2. Elastomeric thermal insulation with permeability rating of .17 perms and Microban antimicrobial protection against mold growth.

3. Temperature range from -40^{O} F to 220^{O} F.

4. Insulation to meet 25/50 requirements for use in return air plenums.

5. Wall thickness as listed in Part 3 of this Section for size and use of piping.

6. Install without slit when possible. All slits in insulation to be smooth. Insulation installed with jagged edges will be removed and replaced at no cost to Owner.

7. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

8. When used on chilled water piping up to 6” diameter use Armacell AP Armaflex Black LapSeal tube insulation. On larger piping and vessels use AP Armaflex FS. Use only factory supplied/approved adhesives.

9. Manufacturers: Armacell Armaflex Type AP Pipe Insulation or equal by Aerocell or K-Flex.

C. TYPE “C”: Blanket Type Duct Wrap Fiberglass Insulation:

1. **The Contractor may use a 3/4, 1 or 1-1/2 pound density product with a minimum installed R-value of 6.0 if ductwork is within building insulation envelope or minimum R-value of 8.0 if installed outside of building insulation envelope.** Density, thickness and installed R-value to be clearly indicated on submittal.

2. Fiberglass duct wrap insulation is to have a factory FSK or FRK facing which acts as the vapor barrier. Maximum permeability rating is 0.02 perms.

3. Use only labeled Type UL181AP Aluminum Foil Tape a minimum of 3" wide and 7.4 mils thick “Venture Tape #1525CW” or “Shurtape #AF-982”). Maintain a complete vapor barrier throughout all ductwork insulation applications. Use spreader to completely seal tape to all joints or tears in vapor barrier, surface must be clean prior to installation.

4. Certainteed SoftTouch Duct Wrap with FSK facing or equal. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

5. Manufacturers: Knauf, Schuller/Manville, Certainteed or Owens-Corning.

D. TYPE “D”: Rigid Fiberglass Board Insulation (DUCTBOARD SYSTEM)

1. 1-1/2" thick, Type 475 with a minimum R-value of 6.0 when inside building insulation envelope.

2. **2" thick, Type 800 with a minimum R-value of 8.0 when outside building insulation envelope.**

3. Rigid board composed of resin bonded glass fibers faced with reinforced foil vapor barrier with permeability rating of .02 perms.

4. Meet UL181 test and classified as Class I Air Duct. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

5. Maximum operating temperature of 250^{O} F.

6. Tape joints using heavy duty foil tape, UL181A labeled, 7.5 mils thick, 3 inches wide, FSK Facing Tape Venture or equal.

7. Manufacturers: Certainteed, Knauf, Schuller/Manville, Owens-Corning.

E. TYPE "E": Semi-rigid Fiberglass Insulation Board.

1. Semi-rigid glass fiber bonded insulation not affected by moisture, resistant to fungi and bacteria. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

2. Permit expansion and contraction of metal without cracking or shrinking.

3. Maximum operation temperatures of 850^{O} F.

4. Manufacturers: Certainteed 850 Fiberglass Insulation, Knauf, Schuller/Manville, Owens-Corning.

F. TYPE "F": FIRE RESISTIVE DUCT WRAP

1. Work of this section includes labor, material and equipment to provide 2 hour, fire resistive rated grease or air duct enclosure as a shaft alternative and a method for providing zero inch clearances around commercial kitchen grease duct exhaust systems to combustible materials.

2. Lightweight flexible refractory ceramic fiber blanket encapsulated with aluminum foil scrim. Nominal 1 ½" thick, 9 PCF.

3. UL Classified, double layer, fireproof, flexible, 2 hr. rated enclosed assembly with offset seams and stainless steel bands as required to meet 2 hr requirement.

4. Zero clearance to combustibles.

5. Use in combination with 3M Fire Barrier, 2000+ silicone sealant.

6. 3M, UL system V-17. Install as listed.

7. Manufacturer: 3M FireMaster Fast Wrap or equal by Unifrax Fyrewrap or Pyroscrat as approved by local AHJ.

G. TYPE "G": Cellular Elastomeric Foam Duct Liner:

1. Thermal conductivity K = .27 @ 75^{O} F. mean temperature.

2. Elastomeric thermal insulation with permeability rating of .17 perms.

3. Temperature range from -40^{O} F to 220^{O} F.

4. Insulation to meet 25/50 requirements for use in return air plenums.

5. Minimum R-value of 6.0 for one and one-half (1-1/2") thickness. Installed R-value to be a minimum of 6.0 inside building envelope. Minimum R-8 for ducts located outside the building insulation envelope.

6. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

7. Manufacturers: Armacell Armaflex AP or Armacell Coilflex elastomeric foam duct liner with Microban.

H. TYPE "H": Pre-molded Isoline Phenolic Foam Piping Insulation :

1 Jacket Type:

f. Thermal conductivity K = 0.24 at 100^{O} F. mean temperature.

g. Factory applied kraft-reinforced vapor barrier flame retardant all service jacket and tape, with permeability rating - 0.02 perms. WMP-ASJ All service jacket with polymer film exterior surface that is smooth, durable, cleanable, wrinkle resistant, resists water staining and that does not support mold or mildew growth.

h. Provide insulation sections with self-sealing pressure sensitive adhesive on both overlap seam and mating jacket surface.

i. Fitting insulated with pre-cut insulation inserts covered with PVC fitting cover properly vapor sealed.

j. Manufacturer: Owens-Corning Fiberglass SSL II with ASJ Max or equal product by: Knauf (**NO MANSON**) or Manville with equal jacket.

2 Secondary Jacket (This goes on over properly sealed standard WMP-ASJ jacketing) All piping run within unconditioned indoor spaces such as Mechanical Room and Crawl Space or ventilated attic spaces):

f. PVC jacket Shall be used in <u>all</u> mechanical/boiler rooms for all insulated piping to within two inches (2") of interior wall surface of mechanical/boiler rooms. This includes all satellite mechanical rooms containing air handlers.

g. One (1) piece “hinged” construction.

h. **Entire piping system in mechanical rooms is to be covered with high-impact, UV-resistant polyvinyl chloride jacketing with gloss white finish.** Properly seal all joints. Follow manufacturers written installation instructions.

i. ALL Fittings to be insulated with pre-cut insulation inserts and are to be covered with PVC fitting cover.

j. All piping in Unconditioned spaces other than mechanical rooms are to be

wrapped with mold resistant Polyguard ZERO-PERM vapor barrier membrane. Properly seal all joints. Follow manufacturers written installation instructions.

2.03 SOUND CONTROL

A. Lined Duct:

1. Provide acoustically lined duct to attenuate and control the transfer of airborne sound and as duct insulation only when specifically indicated.

2. Lining: Rigid board type fiberglass insulation, bonded with thermosetting resin. Maximum flame spread index; 25. Maximum smoke developed index; 50. R-value of 6.3 for one and one-half inch (1-1/2") thickness. Installed R-value to be a minimum of 6.0. **Lining to have anti microbial coating** CERTAINTEED 1-1/2", R-6 Toughgard Rigid Liner Board or equal. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**]

3. Lining: Flexible fiberglass blanket type mat faced insulation with durable surface coating, bonded with thermosetting resin. Maximum flame spread index; 25. Maximum smoke developed index; 50. **Lining to have anti-microbial coating.** Minimum R-value of 6.0 for one and one-half (1-1/2") thickness. Installed R-value to be a minimum of 6.0. **1.5" thick, R-6 lining equal to CertainTeed ToughGard R-EP or ToughGard2 Textile Duct Liner.** R-8 for ducts located outside the building insulation envelope. **ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

4. Air Friction Correction Factor 1.12 at 500 fpm or less.

5. Minimum sound absorption co-efficients as follows:

Thickness	Frequency					
	125	250	500	1000	2000	4000
1-1/2"	.17	.53	.87	.99	1.00	.95

6. All duct dimensions shown on drawings are net clear inside dimensions with duct liner. Install liner in compliance with requirements of NFPA 90A.

7. Manufacturers: Shuller, CertainTeed, Knauf or Owens-Corning.

8. All duct liner to be provided with tough abrasion resistant interior air side finish and antimicrobial coating.

2.04 SOUND CONTROL

A. Supply ducts, return ducts, and fittings indicated on drawings, shall be insulated with duct liner meeting the requirements of ASTM C1071 and the additional following requirements:

1. Have a liquid water repellency rating not less than 4 when tested in accordance with INDA IST 80.6.

2. Have a potential heat value not exceeding 3500 btu/lb when tested in accordance with NFPA 259.

3. Maximum rated velocity not less than 6000 FPM when tested in accordance with ASTM C 1071.

4. Resistant to microbial growth using a “no growth criteria” when tested in accordance with ASTM C 1138, G 21 and G22.

5. Type I - Blanket material, in roll form,

a. **[**1/2" (13mm), 1"(25mm), 1-1/2" (38mm), 2" (51mm)**]** thick, **[**Type150, Type 200, Type 300**]** shall have a maximum thermal conductivity(k-value), at 75°F (24°C) mean temperature, of **[**.27 Btu.•in/hr.•sq.ft.•°F (0.039 W/m.•°C), .25 Btu.•in/hr.•sq.ft.•°F (0.036 W/m.•°C), .24 Btu.•in/hr.•sq.ft.•°F (0.035 W/m.•°C**]**. when tested in accordance with ASTM C 518.

b. Sound absorption coefficients and NRC rating shall meet or exceed the following when tested in accordance with ASTM C 423 using an “A” mounting.

Absorption Coefficients @ Octave Band Frequencies (Hz)

Thickness	Type	125	250	500	1000	2000	4000	NRC
½”	200	.05	.15	.35	.61	.75	.88	.45
1”	150	.06	.27	.66	.87	.98	.99	.70
1-1/2”	150	.18	.53	.97	1.06	1.06	.90	.90
2”	150	.24	.74	1.12	1.11	1.07	1.08	1.00

c. **CertainTeed ToughGard R-EP Duct Liner {Type 150, Type 200, or Type 300} ALL INSULATION IS TO BE FREE OF UREA-FORMALDEHYDE AND/OR BE GREENGUARD CERTIFIED.**

6. All ductwork to be insulated with minimum R-6 duct liner unless specified otherwise.

2.05 INSULATED FITTING COVERS AND JACKETING

A. High-impact, UV-resistant polyvinyl chloride jacketing with gloss white finish.

B. Pre-cut curled jacketing, 30 mil. thickness. Sized to snugly fit pipe diameter with thickness of insulation specified.

C. Joints and seams sealed with Perma-Weld Adhesive to form a complete vapor barrier for chilled water and domestic cold water systems. Use tack and tape for heating water and domestic hot water systems. Installation of adhesives, tacks and tape shall be per manufacturer's recommendations. Submit installation instructions with submittal of materials.

D. Fitting Covers: Covers shall be pre-formed for fitting shape.

E. Manufacturer: Manville Zeston 2000 or Proto.

2.06 CANVAS JACKETING

A. Insulating Lagging Canvas: 8oz./sq. ft. minimum, 28 threads per inch minimum, Osnaberg or

equal.

B. Lagging Adhesive: Plastic synthetic resin emulsion adhesive; watertight, mildew resistant, fire retardant; Miracle LA69, Borden Aerosol or equal. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

2.07 METAL OR VINALUM JACKETING

A. Material shall be minimum .016" thick aluminum jacket or vinalum .020" thick aluminum faced PVC jacket with integral factory applied vapor barrier.

B. Elbows, fitting and valves shall be metal preformed fitting covers (no gores acceptable). Valves made from .020 metal. All valves ends and where insulation reduces, shall have Pittsburgh seams.

1. All straight line metal to be Z-locked jacket held in place with 3/4" wide aluminum bands at nine inches (9") on center with wing seals.

C. All joints and seams shall be watertight with Childers CP-76 OR Foster 95-44.

D. Manufacturer: "Strap-On" Childer Cawed Systems or equal.

2.08 COATINGS

A. All coating to bear the UL label. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

B. On cold or dual service lines, use vapor barrier type coatings.

2.09 METAL SHIELDS (SADDLES)

A. Metal Shields curved to fit up to midpoint of the insulated pipe.

B. Metal shields shall be 16 gauge, twelve inches (12") long for pipes up to two inches (2"), 14 gauge, eighteen inches (18") long for piping 2-1/2" to 4", twenty four inches (24") long for piping 5" to 6", 14 gauge, thirty inches (30") long for piping over 6".

C. Provide rigid insulation for entire length of saddle plus 4" (2" at each end) to properly support piping. All piping support to be on exterior of insulation.

2.10 PRE-INSULATED PIPES

A. Pre-insulated with minimum 60 mil. PVC jacket, manufactured by Southwest Insul-Pipe.

B. Insulation shall be foam-in-place polyurethane minimum two inches (2") thick.

C. All fittings, joints, and valves shall be reformed half section type with insulation.

D. Piping to be heat traced.

E. Use waterproof cawed material for all fittings and joints.

[F. Mastics shall be outdoor type.]

PROJECT NAME

PART 3 - EXECUTION

3.01 SURFACE PREPARATION AND WORKING CONDITIONS

A. Apply all insulation, fitting covers, mastics and sealants per manufacturer's recommendations.

B. Do not apply insulation materials until all surfaces to be covered are clean and dry and all foreign materials such as rust, dirt, etc., are removed.

C. Keep insulation clean and dry during installation and during the application of any finish.

D. Do not install the insulation on pipe fittings, and pipe joints until the piping is tested and approved.

E. Do not apply under conditions of excessive humidity or at temperatures below 50^{O} F or above 100^{O} F.

3.02 TECHNIQUE FOR APPLICATION TO PIPES

A. Close longitudinal joints of pipe insulation firmly and butt insulation sections firmly together.

B. Neatly and smoothly adhere all laps and butt strips. Adhere three inch (3") wide self-sealing butt joint strips over end joints.

C. Replace all insulation having loose joints or laps. Sloppy work will not be acceptable and such work shall be removed and re-applied.

D. Provide ½" over the thickness of insulation specified at all insulated piping in outside walls.

E. Where insulation with a vapor barrier terminates, it shall be sealed with “Ductmate Protack”. Ends shall not be left raw.

F. On water piping use sheet metal shields outside the insulation at hanger locations. In addition, provide:

1. A molded vegetable cork or foam glass insert not less than twelve inches (12") long of same thickness and contour as insulation between support shield and piping and under the finish jacket.

2. Heavy density insulation minimum six (6) pounds per cubic foot under entire length of metal shield.

G. Where piping and fittings are installed out of doors, provide [two-layer glass cloth and four-layer weatherproof vapor barrier adhesive coating, in addition to jacket specified] vapor barrier jacket, cover with metal or vinalum jacket with seams located on bottom side of horizontal piping.

3.03 TECHNIQUE FOR APPLICATION TO PIPE FITTINGS, UNIONS AND VALVES

A. On insulated piping with vapor barrier, insulate fittings, unions, valves and flanges including Victaulic and Gustin-Bacon to the same thickness as the pipe insulation.

B. Any of the following methods of insulation is acceptable:

1. PVC Snap Form Fitting Covers: Wrap all valves and fittings with precut fiberglass

insulation wraparound inserts. Brush vapor barrier mastic on adjoining section of pipe insulation and on overlapping edges of jacket and throat seam before applying preformed fitting. Secure cover with stainless steel tacks. Tape joints with pressure sensitive vapor barrier tape.

2. [Blanket Wrap: Wrap the fitting with compressed glass fiber blanket. Wire the blanket securely in place, then cover with a smooth layer of insulating/finishing cement. Cover with glass mesh tape, adhering it with an adhesive coating.]

3. [Fabricated Segments: Cut mitered segments from pipe insulation that has the same wall thickness as adjacent pipe insulation, to form a cover which will fit snugly around the fitting. Wire the segments firmly in place and seal the joints with insulating/finishing cement. Apply adhesive coating and wrap with glass mesh tape, then apply another layer of the same coating over the whole assembly.]

4. [Cement: Apply insulating finishing cement, molding it to the contour of the fitting. When area is large, apply an under layer of cement, wrap this with glass mesh tape, then apply an outer layer of cement. If the insulation is not concealed, the exposed surface of insulating/ finishing cement is to have a final glass mesh tape wrap embedded in adhesive.]

[C. In each of the listed methods, to protect the insulation against contact damage, apply an adhesive coating when the cement is completely dry and hard, then wrap with glass mesh tape. Apply another coating of adhesive over the whole assembly.]

3.04 TECHNIQUE FOR APPLICATION TO DUCTWORK

A. Impaling Over Pins: Install all insulation with edges tightly butted. Impale insulation on pins welded to the duct and secure with speed clips. Trim off pins close to speed clip. Space pins as required to hold insulation firmly against duct surface, but not less than one pin per square foot. Seal all joints and speed clips with glass fabric set in adhesive. Provide metal angle at corners to protect edges of insulation.

B. Other Method of Securement: If the welded pin method is impossible, secure the insulation to the duct with “Ductmate Protack” or Childers CP-127 or Foster 85-60 adhesive. Cover the entire surface of the metal with adhesive when applying to the underside of horizontal ducts. Application to top and sides may be in strips with a minimum of 50% coverage. Additionally, secure insulation with No. 16 galvanized wire on not more than twelve inch (12") centers. Provide metal angle at corners to protect edges of insulation. Seal joints as above. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

C. Where external insulations terminate, seal insulation to ductwork with Childers CP-35 or Foster 30-65 with 3" glass fiber reinforcing mesh.

D. Impale rigid insulation board over pins. Provide two layers of glass cloth and four layers of weatherproof vapor barrier adhesive coating. Install .040 thick lock-formable aluminum jacket over sealed insulation. All joints are to be 1” standing seams. The top of the aluminum jacket is to slope a minimum of 1” in 12” to sides to prevent collection of water. Install tapered insulation under sloped top for support of aluminum jacket. Provide a minimum of 1” flange out at connection point to mechanical equipment and building to ensure that water does not get under jacket. Provide counterflashing that is appropriate for building material type. Coordinate with Architect to ensure a watertight connection to building.

3.05 EXAMINATION (LINED DUCTWORK)

A. Verify that the duct liner products are installed in accordance with project drawings, duct liner operating performance parameters and limitations, and provisions of NAIMA FGDLS or SMACNA HVAC DCS or manufacturer's recommendations.

3.06 INSTALLATION (LINED DUCTWORK)

A. All portions of duct designated to receive duct liner shall be completely covered with duct liner. All joints shall be neatly butted and there shall be no interruptions or gaps. Duct liner shall be installed with the Printed air stream surface treatment exposed to the air stream.

B. Duct liner shall be adhered to the sheet metal with 90% (minimum) coverage of adhesive complying with the requirements of ASTM C 916. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

C. All transverse edges that are not to receive sheet metal nosing shall be coated. Longitudinal joints shall occur at the corners of ducts. If duct size and standard duct liner product dimensions make exposed longitudinal joints necessary, such joints shall be coated with adhesive designated for duct liner application and which meets the requirements of ASTM C 916. Such joints shall be additionally secured with mechanical fasteners in accordance with NAIMA FGDLS, or SMACNA HVAC DCS as if they were transverse joints.

D. Duct liner shall be additionally secured with mechanical fasteners complying with the requirements NAIMA FGDLS or SMACNA HVAC DCS and of the correct type for the duct liner being installed. Fasteners may be either weld-secured or impact-driven, and shall be installed perpendicular to the duct surface. Mechanical fasteners shall not compress the insulation more than 1/8" (3 mm) based on nominal insulation thickness. Fastener spacing with respect to interior duct dimensions shall be in accordance with NAIMA FGDLS or SMACNA HVAC DCS. Fastener heads or washers shall have a minimum area of 0.75 in^2 (484 mm^2), with beveled or cupped edges to prevent their cutting into the duct liner.

E. Where air velocities exceed 4000 fpm (20.3 m/sec), metal nosing (either channel or "zee" profile) shall be installed on upstream edges of liner duct sections.

F. Metal nosing shall be securely installed over transverse liner edges facing the airstream at fan discharge and at any point where lined duct is preceded by unlined duct.

G. Duct liner in roll form shall be folded and compressed in the corners of rectangular duct sections, or shall be cut and fit to assure a lapped, compressed corner joint

H. Duct liner in sheet form shall be cut and fit to assure tight, over-lapped corner joints. Top pieces of liner shall be supported at the edges by the side pieces

I. Any damage to the air stream surface must be repaired by coating the damaged area with adhesive or coating designed for duct liner application. Adhesive or coating shall meet requirements of ASTMC916.

3.07 FIELD QUALITY CONTROL (LINED DUCTWORK)

A. Upon completion of installation of lined duct and before HVAC system start-up, visually inspect the ductwork and verify that duct liner has been correctly installed. Confirm that the duct system is free from construction debris.

B. After the lined duct system is completely installed and ready for service, conduct a final inspection of the entire system. This inspection should include, at minimum, the following steps:

1. Check all registers, grilles, and diffusers to ensure that they are clean and free from construction debris.

2. Check all filters in accordance with their manufacturer's instructions. Use specified grade of filters at all times that system is operating.

3. Cover supply openings with filter media prior to system start-up to catch any loose material that may remain inside the ductwork.

4. Turn the HVAC system on and allow it to run until steady state operation is reached.

5. Remove the temporary filter media from supply openings and, along with it, any loose material blown downstream and caught by the filter media.

6. Check to ensure that air delivery performance meets all requirements and complies with SMACNA leakage specifications.

3.08 PROTECTION (LINED DUCTWORK)

A. Contractor’s employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats and eye protection.

B. The contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.09 COLD PIPING INSULATION

A. Insulate piping for domestic cold water, rain leaders, from primary and overflow roof drains, using one inch (1") Type "A" or Type “B” Insulation.

B. Provide a complete vapor barrier throughout the entire system. Use only vapor barrier adhesives and coatings. Stapling of jacket not permitted. Penetrations in vapor barrier jacket, joints, and seams sealed vapor proof with Childers CP-35 or Foster 30-65 (white) mastic. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

C. Cover ends of insulation sections with an adhesive coating at intervals of not more than twenty feet (20'). Insulate accessories, valves, flanges, etc.

D. Cover insulation on fittings with spiral-wrapped glass mesh tape. Finish with a vapor barrier coating applied approximately 1/16" thick.

E. Insulate all horizontal runs at primary and overflow roof drain rain leader piping from bottom of roof deck to include roof drain body, to one foot (1') past turn down fitting in vertical

direction. Vertical rain leaders need not be insulated when concealed, routed inside wall cavity.

F. Insulate all cold water piping above ceiling to point where piping turns down into chase. When piping turns down into exterior walls, piping in exterior walls must be insulated.

3.10 HOT & TEMPERED PIPING INSULATION

A. Insulate domestic hot and tempered water and circulating lines using one inch (1") Type "A" insulation one inch (1") thickness for ½" to one inch (1") piping, 1-1/2" thickness for 1-1/4" to two inch (2") piping and two inch (2") thickness for 2-1/2" to six inch (6") piping. Domestic hot water lines may be insulated with one inch (1") Type "B" insulation.

B. Staples may be used to seal jacket.

C. Insulate unions, valves and flanges in boiler room only for piping over 140^{O} F. Insulate with same method used for cold pipe fittings, except vapor barrier mastic is not required.

D. Do not insulate valves, flanges, and unions for domestic hot water piping systems below 140^{O} F., but bevel and seal ends of insulation at such locations.

E. Insulate hot water expansion tank and air separators with one inch (1") sheet type "B" insulation.

3.11 SPECIAL PIPING INSULATION REQUIREMENTS

A. Insulate buried domestic hot and cold water lines under building with one inch (1") Type "B" Insulation. Bond joints using an adhesive; apply surface treatment as recommended by insulation manufacturer, taping not permitted. Set in sand bed and cover with minimum five inches (5") sand. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

B. **Insulate all refrigerant piping for heat pump systems and suction lines only for all other systems with Type "B" Insulation:** ½" thickness for piping up to 1" and 3/4" thickness for piping larger than one inch (1"), apply per manufacturer's recommendations. Glue all joints and seams with Armaflex 520 Adhesive BLV LOW VOC. Protect all insulation on piping outside with two (2) coats of "WH" Armaflex Finish Coating for weather protection. [Protect all insulation on piping outside with "Armacell Arma Chek System" to include Arma Chek Base Coating with Arma Chek Web, Glass Fiber Mat Reinforcement and Gray Arma Chek Top Coat. Install per manufacturer's recommendations.] No tape is allowed. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

C. Insulate all exposed p-traps and water connections for handicapped lavatories with White "Truebro Handi Lav-Guard" Insulation Kit Model #102W (Use Model #105W when 5" offset strainer is used). (Phone: 203-875-2868), or equal products as manufactured by Brocar Products Inc., (Phone: 512-847-1524).

D. Insulate p-trap of all floor drains above the first floor and deep seal traps that receive condensate. Insulate with 3/4" thick Type "B" Insulation.

[E. Insulate chilled water expansion tank & air separator with one inch (1") sheet type "B" insulation.]

3.12 DUCT INSULATION REQUIREMENTS

A. Insulate Ducts as Follows:

1. Thickness and Type:

a. Exhaust Air and Outside Air Exhaust Ducts: Externally wrap with Type “C” Insulation; insulate from roof deck/wall exterior back three feet (3') into space. (R-6)

b. Rooftop Units: Internally line rooftop unit supply and return air drops past first ninety degree elbow, reference Specification Section 20 07 00, 2.03, Sound Control for Liner. Provide access door in duct risers for access and cleaning. Minimum size 18 x 18. (Exception: Rooftop unit serving kitchen is to have the supply air drop internally lined and the return air drop externally wrapped with Type “C” Insulation.). R-8 for ductwork located outside or in attic spaces and R-6 for all other ducts inside the building insulation envelope.

c. Supply Air: Externally wrapped with Type “C” Insulation, unless specifically noted otherwise. [Internally lined per Section 20 07 00]. R-8 for ductwork located outside or in attic spaces and R-6 for all other ducts inside the building insulation envelope.

d. Return Air: Externally wrapped with Type “C” Insulation, unless specifically noted otherwise. [Internally lined per Section 20 07 00]. R-8 for ductwork located outside or in attic spaces and R-6 for all other ducts inside the building envelope.

e. Outside Air: Supply ducts externally wrapped with Type “C” Insulation. R-8 for ductwork located outside or in attic spaces and R-6 for all other ducts inside the building insulation envelope.

f. Relief Air: Externally wrap with Type “C” insulation when run through unconditioned spaced, unless specifically noted otherwise. R-8 for ductwork located outside or in attic spaces and R-6 for all other ducts inside the building insulation envelope.

g. Air Devices: Externally wrap backs of all supply, return and exhaust air devices including square to round adapters and boots with Type “C” Insulation. Properly seal all edges. Use R-8 insulation for air devices with backs outside of building insulation envelope and R-6 insulation when backs of air devices are located inside building insulation envelope.

h. Grease Rated Kitchen Exhaust: Shall be installed in one (1) hour enclosure with minimum three inches (3") clear, maximum twelve inches (12") clear, reference Architectural. Coordinate access doors with enclosure. As an option to installing grease rated exhaust duct in a one (1) hour enclosure, insulate with Type “F” insulation installed to meet manufacturer’s written instruction for this application.

i. Kitchen Supply: Type “C” or Type “D” Insulation. R-8 for ductwork located outside or in attic spaces and R-6 for all other ducts inside the building insulation envelope.]

j. Exterior Ductwork: R-8 Type “E” and/or duct liner insulation.

k. Special circumstance as noted: R-6 or R-8 Type “G” duct liner insulation.

3.13 CONDENSATE PIPING INSULATION

A. Condensate piping to be insulated with Type “B” Insulation 1/2" thick. Entire condensate system to be insulated when copper pipe is used.

1. Apply per manufacturer's recommendations. Glue all joints and seams with Armaflex 520 BLV LOW VOC Adhesive. No tape will be allowed. Auxiliary condensate not required to be insulated. Protect all insulation on piping outside with two (2) coats of “WH” Armaflex Finish Coating for weather protection. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

[B. PVC piping to be insulated with Type “B” Insulation 1/2" thick. Insulate pipe from unit connection to a point six feet (6') downstream of trap. Glue all joints.]

3.14 CHILLED WATER PIPING INSULATION

A. Insulate chilled water piping using Type “A” Insulation. One inch (1") thickness up to two inch (2") piping and 1-1/2" insulation from 2-1/2" to ten inch (10") piping.

B. Chilled Water Piping Outdoors:

1. Piping to be pre-insulated type with two inch (2") foam-in-place polyurethane. Reference Section 2.07.

2. Install per manufacturer's recommendations.

C. All hangers to be installed on the outside of the insulation and shall not be in contact with the pipe. Use metal shields between the insulation jacket and the hanger. Provide heavy density insulation or cork inserts at shields.

D. Insulate all fittings with one (1) piece pre-molded PVC insulation fittings with insulation inserts to same thickness as adjoining pipe insulation.

E. Maintain complete vapor barrier throughout system. Seal all jacket penetrations, seams, edges and joints with vapor proof mastic. **ALL ADHESIVES, SEALANTS AND COATINGS MUST MEET OR EXCEED GREEN BUILDING PROGRAM SCAQMD RULE 1168 AND 1113.**

END OF SECTION

PROJECT NAME

SECTION 22 01 00 - INSIDE UTILITY TRENCH EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes general requirements, products, and methods of execution relating to excavation, backfill and compaction of inside trenches for mechanical work. Inside trenches are those which occur within an arbitrary, imaginary boundary five feet beyond the outside perimeter of the structure.

B. Scope: Provide all trench work for mechanical work of every description and of whatever substance encountered to the depth indicated, or to provide pipe slopes and elevations shown on the drawings. Excavate and backfill utility trenches. Place and compact bedding material. Compact backfill material.

C. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

1.02 APPLICABLE CODES

A. Local Codes and Ordinances

B. Texas Safety Standards

C. OSHA - Section 1926.650

1.03 SAFETY PRECAUTIONS AND PROGRAMS

A. It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar and comply with all requirements of Public Law 91-696, 29 U.S.C. Secs. 651 et. seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto, and to enforce and comply with all of the provisions of this Act. IN ADDITION, ON PROJECTS IN WHICH TRENCH EXCAVATION WILL EXCEED A DEPTH OF FIVE FEET, THE CONTRACTOR AND ALL OF ITS SUBCONTRACTORS SHALL COMPLY WITH ALL REQUIREMENTS OF 29 C.F.R. SECS. 1926.652 AND 1926.653, OSHA SAFETY AND HEALTH STANDARDS.

PART 2 - BEDDING MATERIAL

2.01 BEDDING MATERIAL

A. Select bedding material from trench excavation using care to separate it from unsuitable material. If suitable bedding material is not available from trench excavation, import it from sources approved by the Architect.

B. Use clean sand. Maintain moisture content within a range that will allow specified compaction.

2.02 TRENCH BACKFILL

A. Obtain trench backfill material from trench excavation. If sufficient suitable trench backfill material compatible with structural backfill is not available from trench excavation, import it from sources approved by the Architect.

B. Use granular material, free from large stones, boulders and debris. Maintain moisture content within a range that will allow specified compaction. Maximum aggregate size four inches (4").

PART 3 - EXECUTION

3.01 EXCAVATION

A. Place all excavated material suitable for backfill in an orderly manner, and in conformance with safety codes.

B. Dispose of all material not suitable for backfilling.

C. Form bell holes so pipelines rest on continuous undisturbed soil. If larger rocks or boulders are encountered, remove them. If trenches are below specified grade, backfill to required depth with select granular materials free from debris and rock, and compact to proper grade before installing piping.

D. Follow manufacturer’s recommendations for minimum trench width, material type and cover requirements.

3.02 LOCATION

A. Locate trenches to accommodate utilities shown on the drawings.

B. Construct trench with adequate width to allow compaction equipment to be used at the sides of pipes.

C. Make trench side slopes conform to prevailing safety code requirements.

3.03 DEWATERING

A. Perform whatever work is necessary to prevent the flow and accumulation of surface or ground water in the excavation.

3.04 TIMING

A. Do not backfill until underground mechanical system has been properly tested, inspected and approved.

B. Coordinate with the work of others, and complete all trench work in a timely manner.

3.05 BEDDING

A. Place bedding material under, around, and over the pipe in lifts not exceeding 8" in depth.

B. Work material around pipe by hand methods, taking care to keep any oversize or sharp

stones out of contact with the pipe, and to provide uniform support for the pipe.

C. Cover pipe with bedding material to building subgrade or to a minimum 12" depth before adding other backfill.

3.06 BACKFILLING

A. Continue placing backfill material until trench is completely filled to building subgrade, or as shown on the drawings.

B. Place backfill material in lifts not to exceed 12" in depth.

3.07 COMPACTION

A. Compact all bedding material to at least 95% of maximum density, taking care not to damage the pipe.

B. Compact all backfill under footings, slabs, and other structures to 95% of maximum density or more, if required by the Architect.

C. Compact other areas to preclude future settlement, or at least 85% of maximum density.

3.08 FINISHING

A. After completion of backfilling, dispose of excess material and smooth the surface to grade.

B. Do not allow heavy equipment to be used over backfilled work that does not have sufficient cover to prevent pipe damage.

3.09 SPECIAL PRECAUTIONS

A. Avoid unauthorized and unnecessary excavations.

B. Minimize number and size of excavations under footings or bearing walls.

C. Support footings, foundations, and walls with timbers and jacks if there appears to be any possible chance of damage, and keep such precautions in place to eliminate possible damage.

D. Backfill under footings and bearing walls, using maximum compaction or concrete of proportions as specified for footings.

E. Avoid damage to all existing underground services, foundations, cables, conduit lines or foundations. Repair any existing underground work accidentally damaged at no additional cost to the Owner.

3.10 UNDER EXISTING SLAB INSTALLATION

A. When breaking out an existing floor slab, make a saw cut and remove concrete. When repouring concrete, compact the fill to the same specifications as the building fill. Re: Architectural/Structural. General Contractor to make necessary saw cuts and patching as required. **Coordinate penetrations of existing grade beams with structural engineer.**

END OF SECTION

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PROJECT NAME

SECTION 22 02 00 - OUTSIDE UTILITY TRENCH EXCAVATION, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Related Work Specified Elsewhere:

1. Section 20 00 00 - General Provisions

2. Section 20 01 00 - Basic Materials and Methods

3. Division 2 - Site Work

B. Description: This section described general requirements, products, and methods of execution relating to excavation, backfill, and compaction of utility trenches outside of buildings. The arbitrary line of demarcation between inside and outside of buildings occurs 5' outside the building perimeter.

C. It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar and comply with all requirements of Public Law 91-696, 29 U.S.C. Secs. 651 et. seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto, and to WHICH TRENCH EXCAVATION WILL EXCEED A DEPTH OF FIVE FEET, THE CONTRACTOR AND ALL OF ITS SUBCONTRACTORS SHALL COMPLY WITH ALL REQUIREMENTS OF 29 C.F.R. SECS. 1926.652 AND 1926.653, OSHA SAFETY AND HEALTH STANDARDS.

D. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

PART 2 - PRODUCTS

2.01 BEDDING MATERIAL

A. Select bedding material from trench excavation using care to separate it from unsuitable material. If suitable bedding material is not available from trench excavation, import it from sources approved by the Architect.

B. Use granular material, free from large stones, boulders and debris. Maximum aggregate size passing a 2" sieve opening. Maintain moisture content within a range that will allow specified compaction.

2.02 TRENCH BACKFILL

A. Obtain trench backfill material from trench excavation. If sufficient suitable trench backfill material is not available from trench excavation, import it from sources approved by the Architect.

PROJECT NAME

B. Use granular material, free from large stones, boulders and debris. Maintain moisture content within a range that will allow specified compaction. Maximum aggregate size 4 inches.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavate trenches to depth and grades as shown on drawings.

B. Place all excavated material suitable for backfill in an orderly manner and in conformance with safety codes.

C. Dispose of all material not suitable for backfilling.

D. Form bell holes so pipelines rest on continuous undisturbed soil. If larger rocks or boulders are encountered, remove them. If ground surface is below specified pipe grade, fill to required depth with granular materials free from debris and rock, and compact to proper grade before installing piping.

3.02 LOCATION

A. Locate trenches to accommodate utilities shown on the drawings.

B. Construct trench with adequate width to allow compaction equipment to be used at the side of pipes.

C. Make trench side slopes conform to prevailing safety code requirements.

3.03 DE-WATERING

A. Perform whatever work is necessary to prevent flow and accumulation of surface or ground water in the excavation.

3.04 TIMING

A. Do not complete backfill until utility system has been properly tested, inspected, and approved.

B. Coordinate with the work of others and complete all trench work in a timely manner.

3.05 BEDDING

A. Place bedding material under, around, and over pipe in lifts not exceeding 8" in depth.

B. Work material around pipe by hand methods, taking care to keep any oversize or sharp stones out of contact with the pipe, and to provide uniform support for the pipe.

C. Cover pipe with bedding material to a minimum 6" depth before adding other backfill.

D. Cover water line with 18" bedding material before backfilling.

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3.06 BACKFILLING

A. Continue placing backfill material until trench is completely filled to finished grade, or as shown on the drawing.

B. Place backfill material in lifts not to exceed 12" in depth.

3.07 COMPACTION

A. Compact all bedding material to at least 95% of maximum density, taking care not to damage the pipe.

B. Compact backfill material to preclude future settlement or at least to 90% of maximum density.

3.08 FINISHING

A. After completion of backfilling, dispose of excess material and smooth the surface to grade.

B. Restore all surface areas to original conditions, or improve as shown on the drawings. Replace all paving, base course, gravel surfacing, sub-base, topsoil or other existing finished surface as shown on drawings.

C. Clean up and finish all construction areas to original condition or better.

END OF SECTION

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PROJECT NAME

SECTION 22 11 16 - WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes specific requirements, products and methods of execution relating to the domestic water distribution system for the project.

B. The work of this section includes: All water distribution work inside the structure, and all outside distribution work up to and including connection to the water source, including provision of the outside water source, or water using apparatus, although the work of this section does include the interface connections at all of these related items.

C. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

1.02 CONNECTION TO UTILITY WATER SYSTEM

A. Coordinate with site utilities to properly locate and interface with the water supply. Stub water 5'-0" outside the building and make connection to water supply. See Civil Drawing for site utility locations.

[A. Coordinate with site utilities to properly locate the water supply and make the connection in accordance with approved practices. Obtain all permits, pay fees, and provide all service incidental to this work.]

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS ABOVE GROUND (INSIDE STRUCTURE)

A. Type "K" or "L" hard drawn copper tubing, wrought solder type fittings, lead free (0.00% lead content) solder or brazed or press fit joints by Viega or Apollo.

2.02 PIPING AND FITTINGS BELOW GROUND

A. 2" and Smaller:

1. Type “K” soft copper, wrought bronze solder type fittings, lead free (0.00% lead content) solder.

2. Use heavy duty Water-Tite-Sleeve as manufactured by IPS Corporation for all piping underslab. Sleeves for 1" and under shall be 25 mil., blue for cold water and red for hot water. Sleeves for 1 1/4" to 2" shall be 6 mil., black in color.

B. 2-1/2" and Larger:

1. Type “K” hard drawn copper, wrought bronze solder type fittings, lead free (0.00% lead content) solder.

C. No joint to be installed under building slab.

[D. PVC Schedule 40 thermoplastic pipe may be used as allowed by code and/or governing authority from a point 5' from building to source of water supply. All fittings to be Schedule 80 PVC.]

2.03 WATER METER

Reference Civil Drawings

PART 3 - EXECUTION

3.01 GENERAL METHODS

A. Make all joints in accordance with manufacturer's recommendations. The tools used shall be the tools adapted to that specific purpose.

B. At all fixtures, install and connect hot water on left and cold water on right, as viewed when facing the fixture.

C. Where required for connections to fixtures, equipment items, etc., employ lengths of red brass pipe with threaded ends of copper to IPS adapters, brass couplings, etc., to the end that there shall be no ferrous pipe in any water piping system.

D. Provide valves on each branch line at the point of connection into the supply and circulating mains serving all batteries of plumbing fixtures. Provide stop valves in each water supply for every plumbing fixture. Each hose bibb is to have an individual shut off valve, separate from valves that would shut down a battery of fixtures. Valves for piping two inches (2") and smaller shall be ball valves.

E. Provide water hammer arrestors with accessible isolation valve equal to Wade Shok-stops, JR Smith Hydrotrol 5000 Series, or Zurn Shocktrols Z1700 Series on cold water and hot water supplies to plumbing fixtures. Provide access door for all concealed arrestors. Shok-stops shall not be installed in the pendant position. **O-ring type arrestors are not considered equivalent. Arrestors are to be installed in locations and sized per Manufacturer’s installation instructions.**

F. Install vacuum breakers on all plumbing lines where contamination of domestic water may occur and on boiler make-up lines and hose bibbs.

G. Insulate all exposed water connections for handicapped lavatories and sinks with “Handi Lav-Guard” Insulation Kit (Phone: 203-875-2868).

3.02 TESTING

A. Test all water piping hydrostatically at 150 psig or 150% of working pressure, whichever is greater, for a period of 24 hours. Observe piping during this period and repair all leaks. Test for lead, certify that lead residual in piping system does not exceed local code requirements.

3.03 STERILIZATION OF DOMESTIC WATER SYSTEMS

A. Sterilize each unit of completed supply line and distribution system with chlorine solution before acceptance for domestic operation.

B. Accomplish sterilization as described below or by the system prescribed by the American Water Works Association Standard C-601. Apply the amount of chlorine to provide a dosage of not less than 50 parts per million. Provide chlorine manufactured in conformance to the following standards:

1. Liquid Chlorine: Federal Specification BB-C-120.

2. Hypochlorite: Federal Specification 0-C-114a, Type 11, Grade B or Federal Specification 0-X-602.

C. Introduce the chlorinating material to the water lines and distribution system after piping system has been thoroughly flushed. After a contract period of not less than 24 hours, flush the system with clean water until the residual chlorine content is not greater than .2 parts per million.

D. Open and close all valves in the lines being sterilized several times during above chlorination.

E. The sterilization process shall be done by persons whose major business is water treatment and sterilization. The Plumbing Contractor shall pay all costs and charges associated to this test and certification.

F. Certify in writing that sterilization has been completed in accordance with these requirements.

END OF SECTION

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PROJECT NAME

SECTION 22 11 17 –WATER HEATERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes specific requirements, products and methods of execution relating to the domestic water distribution system for the project.

B. The work of this section includes: All water distribution work inside the structure, and all outside distribution work up to and including connection to the water source, including provision of the outside water source, or water using apparatus, although the work of this section does include the interface connections at all of these related items.

C. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

PART 2 – PRODUCTS

2.01 GAS WATER HEATER

A. The water heater shall be a sealed combustion system, taking only outside air for combustion and exhausting the flue gas with PVC Schedule 40 or 80 PVC pipe. Wrap both with material to maintain 25/50 in plenum application. Pipe size to match length requirements.

B. The heater as well as all related intake air and exhaust intake air and exhaust gas piping shall be approved for zero clearance to any combustible surface.

C. The heaters tank shall have seamless glass lined steel tank construction with glass lining applied to all water-side surfaces after the tank has been assembled and welded.

D. Heater to have modulating burner.

E. All heaters shall run at a combustion efficiency of up to 96% thermal efficiency. Meet the thermal efficiency and standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IESNA 90.1. Have foam insulation and a CSA Certified and ASME rated T&P relief valve. Have a down-fired power burner designed for precise mixing of air and gas for optimum efficiency, requiring no special calibration on start-up. Heater shall be supplied with maintenance-free powered anode. All heaters shall be approved in accordance with ANSI Z 21.10.3. All heaters shall be supplied with factory installed low water cutoff, and upper hot water sensor, and lower cold water sensor. All heaters shall be furnished with a factory installed condensate trap assembly ready for easy connection to a field supplied condensate drain.

F. The control shall be an integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and shall have digital temperature readout.

G. The BTH-120-250 models are design-certified by CSA International, according to ANSI Z21.10.3-CSA 4.3 standards governing storage-type water heaters. The BTH-300-500 models are design-certified by Underwriter’s Laboratories (UL), Inc. according to ANSI Z21.10.3-CSA 4.3 standards governing storage-type water heaters.

H. Meet the thermal efficiency and standby loss requirements of the U.S. Department of Energy and current edition ASHRAE/IESNA 90.1. Complies with SCAQMD Rule 1146.2 and other air quality management Owners with similar requirements for low NOx emissions.

I. The heater shall be factory assembled; test fired for correct BTU input and adjusted for proper combustion parameters. Complete operating and installation instructions shall be furnished with every heater as packaged by the manufacturer with the heater for shipping.

J. Three year limited warranty on tank with one year on all other parts.

K. Manufacturer: A.O. Smith Cyclone MXiBTH Series, Lochnivar Shield or equal by State or Rheem.

2.02 WATER HEATER

A. Electric Water Heater:

1. Pre-wired, factory tested, NSF certified and with UL seal of approval.

2. Tank: Glass lined and ASME approved for 150 psi working pressure with a minimum of 2" of high density foam insulation; Anode rods for electrolytic protection and hand hole inspection port.

3. Thermostats are to be of the immersion type; one thermostat per each set of 3 elements.

4. The complete system to be protected by energy cut off switch in the event of an over temperature situation.

5. Manufacturer: State, PVI, A.O. Smith, Rheem or approved equal.

2.03 Provide an ASME rated temperature and pressure relief valve with drain piping to the nearest drain receptor for all water heaters. The temperature and pressure relief valve shall be labeled and shall be tested in accordance with ANSI Z21.22.

2.04 Provide heat traps on incoming and discharge lines from water heaters that do not come with factory installed heat traps or are not connected to a recirculation system.

END OF SECTION

PROJECT NAME

SECTION 22 13 16 - LIQUID WASTE TRANSFER

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description:

1. This section describes specific requirements, products, and methods of execution relating to the transfer of liquid waste for the project. The work of this section includes providing the following:

a. All liquid waste piping and fittings:

1) Soil

2) Rain leaders

3) Building sewer

b. All plumbing vents, including their termination.

c. All connections at points of collection of handling:

1) At plumbing fixtures and trims

2) At equipment by others

B. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

C. All materials exposed within a plenum shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke developed index of not more than 50 when tested in accordance with ASTM E 84.

IF PVC OR CPVC IS USED IN PLENUM SPACES IN LIEU OF CAST IRON, THEN PIPING MUST BE WRAPPED WITH CODE APPROVED INSULATION TO PROTECT PIPING AND MEET 25/50 REQUIREMENTS.

D. All waste, vent, sewer and storm lines shall be of cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International as well as conform to the requirements of CISPI Standard 301, ASTM A-888 or ASTM A-74 for all pipe and fittings, and be manufactured by Charlotte, Tyler, or AB&I .

E. All pipe and fittings shall be manufactured in the United States.

F. A complete waste and vent system will be provided to collect sanitary waste from all plumbing fixtures, floor drains, and any other equipment, in accordance with the Plumbing Code, unless indicated otherwise.

G. The drainage piping system will be designed with a minimum slope of 1/4-inch per foot for pipe sizes less than 3-inch and 1/8-inch per foot for sizes 3-inch and larger.

H. The building will have sanitary sewer lines discharging to the site sanitary sewer system.

I. Floor and wall cleanouts will be strategically placed to avoid being located in sensitive areas.

J. Floor drains will be provided for each air handling device, equipment requiring drains, toilet rooms with water closets, and mechanical equipment rooms. A floor drain will be provided at each emergency shower unit.

K. Each floor drain will be provided with a p-trap and a trap primer.

1.02 CONNECTION TO UTILITY SEWER AND STORM DRAIN SYSTEMS (storm drain piping is considered to be piping beyond 5'-0" outside the building)

A. Final wastewater connection point to extend approximately five feet (5') outside the building, as indicated on the drawings. Coordinate with Civil Drawings for wastewater service point to within five feet (5') of the building. **Coordinate with site utilities to insure proper inverts for all lines and connection point prior to installation**. Contact Architect immediately if any conflict is discovered. Make final connection to service line. Obtain all permits, pay fees and provide all services incidental to this work.

[A. Coordinate with site utilities to properly locate the sewer and make the connection in accordance with approved practices. Obtain all permits, pay fees, and provide all services incidental to this work.]

PART 2 – PRODUCTS

2.01 SEWER PIPE UNDERGROUND INSIDE STRUCTURE (INCLUDES TO FIVE FEET FROM BUILDING PERIMETER)

A. Service weight cast iron soil pipe with Tyseal neoprene gaskets.

B. Schedule 40 solid core PVC (DWV pipe and fittings) as allowed by code. Material Data: Type 1, Grade 1 PVC 12454-B, ASTM D-1784.

C. Pipe 1-1/2" and Smaller: Schedule 40 galvanized steel pipe with cast iron drainage fittings.

D. Waste line serving commercial dishwasher in kitchen and associated main to be service weight cast iron soil pipe with Tyseal neoprene gaskets, to a point twenty feet (20') downstream of dishwasher. Remainder of grease system in kitchen may be PVC as listed in 2 above.

2.02 RAINLEADERS BELOW SLAB AND ABOVE GROUND INSIDE STRUCTURE

A. Cast iron soil pipe with heavy weight no-hub fittings.

B. Underground RAINLEADER piping: Use stainless steel couplings (28-gauge, Type 304SS) with neoprene gasket meeting ASTM Standard C-564 meeting FM 1680, Class 1. Husky SD 4000, Clamp-All 80 lb. or equal.

2.03 SEWER ABOVE GROUND INSIDE STRUCTURE

A. Service weight cast iron soil pipe with tyseal neoprene gaskets or cast iron soil pipe with no-hub fittings. Reference 2.06 below.

B. [Schedule 40 solid core PVC (DWV) as allowed by code. Material Data: Type 1, Grade PVC 1120, ASTM D-1784. **Verify if area is used as plenum which requires 25/50 rating.]**

2.04 VENTS

A. All vent piping above slab to be cast iron soil pipe with tyseal neoprene gaskets or no-hub fittings.

B. All vent piping under slab to be heavy weight no-hub fittings.

C. DWV copper with wrought or cast solder fittings.

D. [Schedule 40 solid core PVC (DWV) as allowed by code. Material Data: Type 1, Grade PVC 1120, ASTM D-1784. **Verify if area is used as plenum which requires 25/50 rating.]**

2.05 CAST IRON PIPE/FITTINGS

A. Tyseal Gaskets or MG Couplings.

B. Hubless couplings shall be composed of a stainless steel shield, clamp assembly and an elastromeric sealing sleeve conforming to the most current edition of CISPI 310, listed by NSF International, manufactured in the United States of America, and manufactured by Anaco, Mission, Tyler or Ideal. Provide minimum 80LB torque standard couplings for standard fittings inside structure above slab and heavy duty couplings with double bands rated for 120LB torque for all below slab and underground piping.

2.06 CONDENSATE PIPING

A. Type L or M: Hard drawn copper.

[A. Schedule 40 solid core PVC.]

PART 3 – EXECUTION

3.01 INSTALLATION OF UNDERGROUND PIPING

A. Install pipe and fittings to required grade with hubs and bottom half section in undisturbed soil. Follow manufacturer’s installation requirements.

3.02 INSTALLATION OF ABOVE GROUND PIPING

A. Refer to Section 20 01 00.

3.03 GRADING

A. Grade all horizontal runs of pipe in building and under floor slab at 1/4" per foot downward in direction of flow. If it is absolutely impossible to maintain a grade of 1/4" per foot, piping four

(4) inches in diameter and larger may slope to a minimum grade of not less than 1/8" per foot.

3.04 SUPPORTING

A. Support all horizontal runs of pipe in building at intervals not to exceed 5'-0" and at each change of direction. Provide a support at the base of vertical risers with intermediate supports as required. Brace all adequately to prevent motion, per manufacturer's recommendation. Reference Section 20 01 00, 2.08, B., Mechanical Support Devices and Pipe Supports for further requirements.

3.05 CLEANOUTS

A. Provide cleanouts as shown on plans and in an accessible location at base of all risers in soil, waste and drain piping and at each change in direction in horizontal runs of pipe. In long straight runs, provide a cleanout located at intervals of not more than 75 feet for piping four inches (4") and larger and located at intervals of not more than 50 feet for piping less than four inches (4").

B. Cleanouts shall be located no closer than 24” to a wall.

3.06 VENTING

A. Provide a vent for each trap or as shown on the drawings.

B. Extend each vent vertically to a point not less than six inches (6") above the extreme overflow level of the fixture served before offsetting horizontally. Whenever two or more vent pipes converge, extend each such pipe at least six inches (6") in height above the flood rim level of the plumbing fixture it serves before being connected to any other vent and utilize only approved drainage fittings and materials to connect piping.

C. Provide a building main relief vent for waste piping not provided venting by fixture branch connections. Vent size shall be per code requirement, based upon fixture unit loading in the pipe vented.

3.07 VENTS THROUGH ROOF

A. Extend vents through the roof a minimum distance of 6" and terminate at least 15 ft. horizontally from operable windows, doors, or air intakes, and at least 3 feet above such opening. Do not terminate vents through roof at edge or valley of roof.

B. Flash and counterflash vents through roof. Provide flashings not less than 18" square, with prefabricated 4-pound lead counterflashing. Extend vertical portion of flashing up entire length of pipe and turn down inside the pipe at least 1 inch with turned edge hammered against pipe. Coordinate with type roof and Architectural details and flash them into roof according to the roofing products manufacturer's recommendations.

C. Protect the roof from tools and equipment. Remove all scraps on roof to prevent damage to roof.

3.08 GENERAL

A. No piping shall be permanently concealed before the examination is completed by the authorities having jurisdiction.

B. All fixtures used in conjunction with the conveying of waste substance shall be connected by means of a trap.

C. All connections for floor mounted water closets and waste piping shall be made with appropriate closet flange and wax gaskets.

D. Insulate all exposed p-traps for handicapped lavatories and handicap sinks with "Handi Lav-Guard" Insulation Kit (Phone: 203-875-2868) as required.

E. Provide specialty shielded transition coupling as required at connections between PVC and cast iron fitting.

F. Horizontal to horizontal connections cannot use double combo, double wye and one eighth or sanitary cross fittings.

3.09 TESTING

A. Test all piping in accordance with the requirements of the local codes.

B. Repair leaks and retest system, repeating this process until piping system is free of leaks.

C. Test shall be conducted and completed before any joints are concealed or made inaccessible.

D. Maintain a log of tests indicating date, time, result of test and person doing test.

E. Under floor

1. Test pipe under floors before connecting to sewers.

2. Maintain not less than 15 feet of hydrostatic head.

3. Repair all leaks and repeat until system holds for 2-hours without a drop in water level.

3.10 CONDENSATE PIPING

A. Route insulated copper condensate drain line from each unit to nearest floor drain, deep seal traps, sink p-traps, janitor sink, dry well (exterior units), or roof drain if piped to storm sewer (cannot use roof drain if day lites at surface) code approved or disposal point unless otherwise noted. Condensate shall not drain on to roof. Mechanical Contractor and Plumbing Contractor to coordinate locations. Slope all piping to drain at minimum 1/8" per foot. Drains shall be sized in accordance with equipment capacities as follows:

EQUIPMENT CAPACITY	*MINIMUM PIPE SIZE
Up to 3 tons of refrigeration	3/4"
3 to 20 tons of refrigeration	1"
21 to 90 tons of refrigeration	1-1/4"
91 to 125 tons of refrigeration	1-1/2"
126 to 250 tons of refrigeration	2"

*Minimum size of drain shall not be smaller than drain outlet size for unit.

B. Coordinate mounting heights of units to allow adequate slope for condensate piping to

disposal point.

C. Provide cleanout plug at end of each main run.

D. Drywell (French Drain): The drywell shall consist of a pit not less than 24" in diameter (or 24" x 24") and 24" in depth. The pit shall be filled to within 3" of the finished grade with course gravel. Top 3 inches to be filled with topsoil and sodded. Gravel to be wrapped completely (top, sides and bottom) with heavy duty weed block fabric. Install a 3" perforated PVC drain pipe (centered in drywell) with cap at bottom extending to bottom of pit. 3" perforated pipe to extend 3" - 5" above finished grade. Provide appropriately sized bushing or fittings to rigidly tie to condensate drain line from unit. Perforated pipe above grade will act as air break connection. Twenty-four inch (24") diameter or 24" x 24" x 24" deep can be used for up to 5 ton capacity. Thirty-six inch (36") diameter or 36" x 36" x 24" deep can be used for up to 13 ton capacity. Forty-eight (48") inch diameter or 48" x 48" x 24" deep can be used for up to 30 ton capacity. Confirm final requirements with code authority having jurisdiction.

END OF SECTION

PROJECT NAME

SECTION 22 30 00 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This section describes certain components of domestic plumbing systems, including related specific requirements, products and methods of execution. Plumbing water, waste, vent piping and other primary distribution components of the plumbing system are included with related work specified elsewhere.

B. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

PART 2 - PRODUCTS

2.01 FLOOR DRAINS

A. All floor drains, including floor sinks, are to be the same size as the waste line size indicated on plans. If size is not indicated, drain size shall be 3". Top of floor drains and sinks to be flush with finished floor. Floor drains that tie in to acid waste piping are to have acid resistant coating or be stainless steel. Floor Drains and Floor Sinks in kitchen areas are to have Acid Resistant Enamel coating or be constructed from stainless steel.

B. **PROVIDE TRAP PRIMING APPARATUS FOR EACH FLOOR DRAIN AND FLOOR SINK UNLESS NOTED OTHERWISE.** Whenever possible, use an inverted tee connection from sink tailpiece or device similar to Jay R Smith Prime-EZE for trap priming with gray water. Second choice is to use flush valve trap primer connection. As last resort, provide mechanical trap primer (Manufacturer: Precision Plumbing Products, “Oregon #1 or equal as required) connected to supply lines as small as possible, but never over 1-1/2” diameter. Provide minimum 12 x 12 access door or larger as required. When local jurisdiction (such as the City of Pflugerville, Tx.) does not approve the use of a standard mechanical trap primer (similar to Oregon #1) that activates from pressure differential and other methods are not practical, provide an electronic trap primer as last resort. Coordinate electrical requirements with electrical contractor. Proset “TRAP GUARD” device may be used in lieu of trap primers when allowed by local code authority having jurisdiction and building Owner. Before using Proset “TRAP GUARD” contractor must obtain written approval from Owner and local code authority having jurisdiction and provide copies to Architect and Engineer.

C. Trap primers must conform to ASSE 1018 or ASSE 1044.

D. Trap Primer Manufacturers: MIFAB, Precision Plumbing Products, Jay R Smith, Sloan, Zurn, Wade or Watts.

E. Floor Drain/Floor Sink Manufacturers: StainlessDrains, Kessel, MIFAB, Josam, Wade, Zurn or Jay.R. Smith, Watts.

PROJECT NAME

2.02 ROOF DRAINS

A. Provide 30" square, four pound lead flashing for all roof drains, centered around drain. Coordinate with type roof and Architectural Roof Plan and Architectural details. Roof drains to be installed in low point of roof. Verify low point in roof before installation. Roof drains to be moved at no additional cost to owner if not coordinated and installed in low point of roof to allow for proper drainage.

B. Where horizontal offset is not possible directly below drain connection, install an expansion joint directly under the drain. MIFAB R1900 Series.

C. All roof drains shall be same size as the rainleader piping size serving roof drain as indicated on the drawings.

D. Roof Drains:

RD1 Primary roof drain, cast iron body, flashing collar, gravel stop, ductile iron dome, under deck clamp, extension and sump receiver. MIFAB R1200-M-E-U Series.

RD2 Overflow roof drain same as RD-1, set inlet 2 inches higher than inlet of RD-1. MIFAB R1200-M-E-U-W. Coordinate and confirm final location with roofing consultant prior to rough-in.

E. Manufacturers: StainlessDrains ,MIFAB, J.R. Smith, Zurn, Josam, Wade, Watts or approved equal.

2.03 CLEANOUTS

A. Cleanouts shall be same nominal size of pipe lines up to four inches (4") and not less than four inches (4") for larger lines.

B. Floor Cleanouts: Gas and watertight seal, internal taper ABS cleanout plug, stainless steel or nickel bronze finish, scoriated round top with countersunk screw for installation flush with finish floor. MIFAB C1100R-3 Series. If floor has a waterproof membrane, then add C clamp ring flange.

C. Wall Cleanouts: MIFAB C1400-RD Series. Countersunk plugs, with smooth round access cover and polished stainless steel or nickel bronze finish.

D. Manufacturers: StainlessDrains, MIFAB, Josam, Zurn, Wade, Watts or approved equal.

E. Cleanouts that tie in to acid waste piping to be acid resistant.

2.04 FIXTURES

A. Manufacturers:

1. The fixtures are chosen from standard manufacturers.

2. Provide all similar fixtures and trim from one (1) manufacturer, except where specified otherwise.

3. Equality: The following manufacturers are considered equal, specified item(s) sets minimum standard for acceptability.

a. **Fixtures:** American Standard, Eljer, Kohler, Elkay, Fiat, Sloan, Toto, Zurn, Caroma.

1) All water closet bowls shall have fully glazed trap.

2) All water closet bowls must meet MAP Testing (Maxim Performance Testing) at 1000 grams.

b. **Faucets:** American Standard, Bradley, Elkay, Chicago, Sloan, Zurn, T & S Brass, Moen Commercial. **Must have five (5) year Commercial Warranty**. **PROVIDE CONFIRMATION OF WARRANTY IN SUBMITTAL.**

c. **Stainless Steel Sinks:** Elkay, Bradley, Moen or Just.

d. **Carriers:** MIFAB, J.R. Smith, Josam, Watts or Zurn.

e. **Flush Valves:** Sloan Royal or equal by Zurn

f. **Point of Use ASSE 1070 Lead Free Mixing Valves:** Watts, Powers, Bradley, Leonard, Lawler, Symmons or Moen.

g. **Drinking Fountains/Electric Water Coolers:** Elkay, Acorn Aqua Surf, Oasis or Halsey Taylor, must meet NSF Section 9 in its entirety and meet TCEQ Certification Requirements. Provide letter with submittal data.

h. **Wash Fountains**: Bradley, Wiloughby or Sloan Stone.

i. **Wall Pipe Supports**: HoldRite or Equal

j. **Acrylic Showers**: Lasco, Aquabath

k. **Circulating Pumps**: TACO, Grundfos, Armstrong, Wilo

l. **Stainless Steel Skullery Sinks:** Elkay, Bradley, Just, Advance Tabco, Griffin.

m. Provide wall carriers for ALL wall-mounted fixtures, including wash fountains.

B. Traps, Stops and Supplies:

1. Provide traps, stops and supplies for all fixtures.

2. P-Traps: 17 gauge chrome-plated cast brass. Provide offset type as required to meet ADA space requirements.

3. Supplies: Flexible, chrome-plated, 7538 Series.

4. Stops: Quarter (1/4) turn removable key type, 2302 Series.

5. Supplies and stops are to meet current requirements of NSF61.

6. Manufacturers: American Standard, Brass Craft, McGuire or equal.

C. Fixtures Specified Elsewhere, or Otherwise Furnished. Provide appropriate strainer, tailpiece, trap, waste and supplies. Rough-in and connect only.

D. Faucets:

1. All faucets except commercial kitchen and bar sinks are to meet ANSI/NSF Standard 61 and be listed by NSF as residential drinking water faucets.

2. All faucets not NSF 61 listed, (as described in paragraph 1) must have tin lined waterways or other such material so water flowing through the faucet is not in contact with any material that could allow “Leaching” of lead into the waterway.

3. Commercial kitchen and bar sinks are to meet ANSI/NSF Standard 61 and be listed as commercial faucets. Faucets meeting the stricter residential standards can be used at contractor’s option.

4. Faucets are not allowed to have more than the maximum total lead content as listed by NSF, TCEQ (Health and Safety Code) and EPA.

5. Any faucets which exceed lead concentration “Leaching” into water stream after a minimum of 45 days usage and proper flushing prior to testing shall be replaced by the manufacturer with an acceptable product. All costs of change out incurred will be sole responsibility of the manufacturer.

6. Lavatory faucets to have .5 GPM vandal resistant aerator.

E. Waterways and tanks for all drinking fountains and water coolers shall be constructed of 3. lead-free (0.00% lead) materials. All waterways to be totally free of lead. No lead solder is permitted. All drinking fountains and water coolers to meet latest criteria of TCEQ, EPA and be listed by NSF.

F. All water line, fittings and fixtures in contact with potable water to be “lead free” AB1953 compliant. (.25% or less average lead content). All submittals to state items comply in submittal package.

2.05 FIXTURE FLOW RATES

A. The maximum flow rates for plumbing fixtures are to be no greater than quantities listed below:

1. Toilets – 1.28 gallons per flush GPF) on all projects .

2. Urinals – 0.125 gallons per flush (GPF) on all projects

3. Lavatory (hand sink) – 0.5 gallons per minute (GPM) on all projects

4. Shower – 2.0 gallons per minute (GPM) on all projects

PART 3 - EXECUTION

3.01 Store all fixtures and trim above ground in a covered location not subject to accidental damage by traffic or other construction activities. Handle fixtures and trim carefully to avoid chipping, denting, scratching, or other damage. Replace damaged items with same item in new condition.

3.02 Provide permanent metal and wire positioners, supports and fixture carriers to secure fixtures and piping rigidly in proper alignment without sway or side play.

3.03 Anchor all fixtures securely to withstand applied vertical load of not less than 250 pounds on the front of the fixture, without noticeable movement.

3.04 Install all fixtures plumb, level and flush to the finished Architectural surface, so that the maximum gap between the fixture and the surface does not exceed 3/16 inch. **Grout** under water closets to level fixtures. Caulk the edge of the joint between fixture and surface with silicone or butyl type waterproof caulking compound.

3.05 Adjust all functional components for proper operation in accordance with manufacturer's recommendations, or as otherwise directed.

3.06 Clean all fixtures and trim thoroughly to spotlessly clean condition. Obtain a written certification from the Architect that this has been accomplished.

3.07 Where floor drains or janitor sinks are located over any room, provide waterproof installation.

3.08 Ensure final location of cleanouts have access and ample clearance at cleanout for rodding of drainage system. Check locations before installation. Contact Architect for alternate location if maintenance clearance is a problem. Cleanouts to be moved at no additional cost to Owner for failure to coordinate locations.

3.09 Coordinate slope of floors to floor drains with Architect. Adjust height of floor drain for proper drainage.

3.10 Provide all adapters, flanges, gaskets, etc. as required for proper installation of fixtures. Coordinate fixture placement before core drilling of floor or sleeve installation.

3.11 Insulate all exposed p-traps and water connections for handicapped lavatories with White “Truebro Handi Lav-Guard” Insulation Kit Model #102W (Use Model #105W when 5" offset strainer is used). (Phone: 203-875-2868), or equal products as manufactured by Brocar Products Inc., (Phone: 512-847-1524).

3.12 **No offset flanges will be allowed for installation of water closets.**

3.13 Install all trap priming devices per manufacturer’s installation instructions. Provide shut-off valves at each mechanical or electronic trap primer for service. Install minimum 12” x 12” access doors as required for service of trap priming devices.

3.14 Provide a floor sink with trap priming device in each sprinkler riser room.

3.15 Cleanout locations:

A. On each horizontal drain line 5 feet or greater in length.

B. No more than 50 feet on center.

C. At changes in director of 90 degrees or more (line size).

D. At the end of each continuous waste line.

E. At the end of each battery of fixtures.

F. At each sink and urinal.

G. Additional areas required for service and by code.

END OF SECTION

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PROJECT NAME

SECTION 23 05 93 – TEST AND BALANCE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The section describes general requirements and methods of execution relating to the testing and balancing of the mechanical systems provided on this project. Plans and specifications are complimentary. Carefully look at both.

B. Scope:

1. Furnish the services of a qualified and approved Testing and Balancing Agency to perform the work of this specification.

2. The work of this section includes, but is not necessarily limited to:

a. Testing and balancing all fans, all air handling systems, all energy recovery ventilators and makeup air systems.

b. Providing a final report. Final report to be submitted for review only after all deficiencies have been corrected and design CFM's are achieved.

c. Reference Cx Commissioning specification for additional information and requirements.

C. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

1.02 APPLICABLE STANDARDS

A. SMACNA Manual for the Balancing and Adjustment of Air Distribution Systems.

B. AMCA Publication 203, Field Performance Measurements.

C. AMCA Standard 300-67, Test Code for Sound Rating.

D. National Environmental Balancing Bureau (NEBB) Recommended Procedures.

E. National Balancing Council (NBC)

1.03 PRE-QUALIFIED AGENCY

A. Subcontractor Minimum Qualifications Include:

1. Maintain a complete service organization that has operated within a one hundred (100) mile radius of the project for at least three years prior to bid date of this project.

2. Demonstrate satisfactory completion of three projects of similar size and scope. Provide references if requested.

3. Bids by suppliers, Contractors or any firm not listed in #5 below are not acceptable.

4. Independent, NEBB or TABB certified agency with no affiliation to mechanical contractor.

5. Pre-qualified T & B Agencies are as follows:

   a. Air Technologies (512)280-3398.

   b. PHI (512)339-4757.

   c. CenTex Air Balance Inc (254)913-3132.

1.04 TIMING OF WORK

A. Do not begin testing and balancing until the systems are completed and in full working order.

B. Schedule the testing and balancing work in cooperation with other trades.

C. Complete the testing and balancing before the date of final project completion.

1.05 MECHANICAL CONTRACTOR RESPONSIBILITY TO BALANCING AGENCY

A. Award the test and balance contract to the approved agency upon receipt of contract to allow the Balance and Testing Agency to schedule this work in cooperation with other trades involved and comply with completion date.

B. Put all heating, ventilating, and air conditioning systems, equipment and controls into full operation for the Balancing Agency and continue the operation of same during each working day of testing and balancing.

C. Provide scaffolding, ladders and access to each system for proper testing and balancing.

D. Provide and change pulleys, belts and dampers, add any dampers and correct any installation errors in a timely matter as required for correct balance as recommended by the Balance and Testing Agency or as directed by the Architect after review of Balancing Report, at no additional cost to the Owner.

PART 2 - PRODUCTS

THIS PART NOT USED.

PART 3 - EXECUTION

3.01 INSTRUMENTS

A. Maintain all instruments accurately calibrated and in good working order. Use instruments with the following minimum performance characteristics.

B. Air Velocity Instruments: Direct reading in feet per minute, 2% accuracy.

C. Static Pressure Instruments: Direct reading in inches water gauge, 2% accuracy.

D. RPM Instruments: Direct reading in revolutions per minute, 1/2% accuracy; or revolution counter accurate within 2 counts per 1000.

E. Temperature Readout: Direct reading in degrees F., plus minus 0.1 degrees F.

3.02 GENERAL PROCEDURES FOR ALL SYSTEMS

A. In cooperation with the Contractor's representative, coordinate adjustments of automatically operated dampers and valves, including the controlling thermostats, to operate as specified, indicated, and/or noted.

B. Use manufacturer's ratings on all equipment to make required calculations.

C. MAKE FINAL ADJUSTMENTS FOR EACH SPACE PER HEATING OR COOLING COMFORT REQUIREMENT. State reason for variance from design cfm, i.e., “too noisy”, “too drafty”, etc.

D. Balancing to occur with clean filters when applicable and wet coils when applicable.

3.03 REQUIREMENTS FOR ALL AIR HANDLING SYSTEMS

A. Identify each diffuser, grille, and register as to specific location and area.

B. Identify and list size, type and manufacturer of diffusers, grilles, registers and all equipment tested.

C. In readings and tests of diffusers, grilles and registers, include required fpm velocity and required cfm and test cfm after adjustments. If test apparatus is designed to read cfm directly, velocity readings may be omitted. Identify test apparatus used. Identify wide open (W.O.) runs.

D. Adjust all diffusers, grilles and registers to minimize drafts and excess noise in all areas.

3.04 BALANCING LOW VELOCITY DUCTWORK

A. After adjusting blower to lowest overall point possible, adjust the branch dampers so that each stale air exhaust inlet or outside air supply outlet in the system is to + or - 5% of design airflow on all makeup air units and energy recovery ventilators.

B. All other HVAC systems on the project are to be adjusted as per ‘A’ above except to + or - 10% of design airflow. **However, DX comfort cooling units are to be balanced to never exceed 410 cfm/ton or be less than 300 cfm/ton on highest stage. Notify engineer if plans deviate from this CFM range for guidance. 5 ton units must be balanced to provide under 2000 CFM. Use CFM shown at air devices, *not* nominal CFM shown on equipment schedule. See Note ‘D’ on RTU Master Schedule. On low stage cooling, set units to provide approximately 66% of high stage cooling CFM.**

C. **Adjust the fan for design airflow on constant volume systems. Adjust fan for highest stage airflow on all systems with varying airflow, with fan and compressor on highest stage. On multistage units requiring it, set up fan to match all lower stages of cooling as required. If unit is set up incorrectly with T&B done for high stage with unit only asking for lower stage compressor stage, unit will not dehumidify and balance will have to be redone at no additional cost. Verify proper procedures with equipment manufacturer and engineer**.

D. Read and record the airflow at each return or exhaust inlet and each supply outlet. Balance as required on constant volume and/or highest stage.

E. Secure each branch damper and mark the balanced position of the damper quadrant.

F. Adjust fan for each stage of airflow (to match compressor staging) on all systems with varying airflow.

G. Read and record the airflow at each supply outlet in all lower stages. On infinite variable flow blowers on units with variable speed compressors measure and record airflow at lowest stage of compressor loading.

H. 2 to 6 ton units are generally 2 stage with compressor capacity of either 66% of rated tonnage on low stage or 100% of capacity on high stage. For these units air device CFM is used for high stage operation and low stage CFM is to be set for approximately 66% of listed air device CFM. Some manufacturers have built in logic to drop fan speed to match cooling stage and some require it to be set manually.

I. For larger units with multiple compressors, set blower CFM to match capacity of operational stage(s) of cooling. Confirm capacities and required CFM setting procedures for blower with equipment supplier. Default is 66% of high stage cooling when there are two stages of cooling.

J. For chilled water AHU's set airflow on high to match air device CFM shown. Read sequence of operation. If blower CFM is integrated to chilled/hot water valve opening position, also record lowest blower CFM setting allowed (usually about 35% of air device CFM shown).

3.05 FAN ADJUSTMENT

A. Balance ductwork before making final fan adjustment for highest stage or constant volume.

B. Verify that system is free of debris and that inlets and discharges are not obstructed and that filters are clean.

C. Make pitot traverse of main ductwork to determine total airflow and record.

D. Adjust fan rpm to obtain design airflow.

E. Test and record motor amperage and voltage on each phase leg. Reduce fan rpm if necessary, so that motor running amperage does not exceed motor nameplate amperage. Record final amperage and voltage.

F. Record fan rpm.

G. Test and record system (suction) return and (discharge) supply static pressures on highest CFM.

H. Record airflow.

I. Test and adjust system for minimum design cfm outside air (intake and exhaust), as shown, where applicable.

J. **Test and record entering air temperatures across coils and fans on highest and on lowest stages of cooling/heating**.

K. Test and record leaving air temperatures (heating and cooling) across coils.

L. Test and record entering air temperature and humidity plus leaving air temperatures and humidity delivered to space on all makeup air/outside air units in cooling mode.

M. Test and record static pressure drop across each filter and coil bank on highest stage.

N. Provide test data for each AHU, FCU, RTU, MAU, ERV, EF, SF, ETC., used on project:

Test and document operation of each MAU, RTU, AHU, CU, HP and FAN in all modes of operation and in all stages of operation. Insure that all pieces of HVAC equipment are functioning properly and are properly connected to the control system. **Check and document inlet and outlet temperatures in all stages of cooling, heating, reheat and emergency heating modes, if unit is so equipped.**

3.06 CHILLED/HEATING/COOLING TOWER LOOPS

A. Set pump, chiller, boiler, AHU and tower fluid flow rates as scheduled for all items used on project. Use VFD's for primary balancing means when available. Set all circuit setters and flow controls as required. Test and document operation of each item used on project. Set and record preliminary flow rates and final flow rate settings for highest stage/full flow conditions. **Record temperatures of entering and leaving water at each piece of equipment and associated pressures and pressure drops across equipment**. Insure that all work is done with clean systems and clean strainers.

3.07 BALANCING REPORT

A. Compile the test data and submit 8 copies of the complete test data for forwarding to the Architect for acceptance and/or analysis and recommendations. Report must be complete and all deficiencies corrected prior to submittal to architect.

B. Include a complete list of all test equipment used, including apparatus manufacturer's name, model number, serial number and date last calibrated.

C. Include complete identification of all elements. Identify by unit number, room name and number, air outlet symbol, etc., to clearly and positively identify the location of each element.

D. Include all test data specified in addition to test data recommended in the applicable standards referenced in Part 1. Tabulate all nameplate data at all balanced equipment and at the associated motors.

E. Tabulate data separately for each system. Describe balancing method used for each system.

F. Include at the front of the report a summary of problems encountered, deviations from design, resolution of problems, recommendations and comments.

END OF SECTION

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SECTION 23 09 00 – CONTROLS (NATIVE BACNET)

PART 1- GENERAL

1.01 DESCRIPTION

A. Description:

1. This section describes specific requirements, products, and methods of execution related to the system of temperature controls and instrumentation for all HVAC equipment (unless otherwise noted)on the project.

2. Provide a new web based DDC control system for the new Expo Center.

3. **BAS Contractor to provide complete lighting relay control panel for lighting controls**. Electrical Contractor to install lighting control panel and provide and install all 120V and greater wiring. BAS Contractor to install all low voltage control wiring including low voltage switches. Electrical Contractor to install all junction boxes and conduits for switch locations. Reference electrical drawings for additional information.

4. Work to include a complete automatic temperature control including any and all control devices 120 volt and low voltage wiring and conduit (which is not provided by Electrical Contractor, reference Specification Sections 20 00 00 and 26 05 80) DDC controls, valves, dampers, relays and instrumentation necessary to obtain all functions and sequences hereinafter specified. Verify with Electrical Contractor on location where 120 volt power may be obtained.

5. OWNER'S INSTRUCTIONS:

a. Provide an instruction period lasting no less than 24 hours to completely familiarize operating personnel with the control systems on the project. Schedule times with District.

b. Session shall be job specific/hands-on training. Obtain written certification that this instruction period has taken place. Instruction session should only occur after all as-built drawings have been completed and all documentation concerning control programs, control point indications and other pertinent data necessary for the project are completed.

6. Control System must be Native BacNet.

B. Scope:

1. Furnish the services of a qualified and approved temperature control subcontractor to provide the work of this specifications section. Unless otherwise noted, this is substantially a “performance” specification.

a. Maintain a complete engineering, sales, installation and service organization that has operated within the Austin area for at least three years prior to bid date of this project.

b. Maintain a full time service office providing complete service capability during the one year warranty period.

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c. Demonstrate the capability to provide service after the warranty period, within 24 hours of notice.

d. Maintain a complete stock of replacement parts.

e. Remain on 24 hour call for emergency service.

f. Demonstrate satisfactory completion of five projects of similar size and scope. Provide references if requested.

g. All application design of the DDC control system shall be performed in the office of the control system manufacturer by system analysts skilled and experienced in control design of HVAC system similar to those specified herein. In addition to the language manuals, flow charts, listing, and other documentation specified, the manufacturer shall maintain a software test, debug, and development facility in their office to support software additions and modifications in an off-line environment to minimize on-site disruptions during major changes. At the end of the warranty period, the Contractor shall prepare two duplicate copies of all control software on non-volatile magnetic media.

h. The entire system provided by the Contractor and installed by mechanics regularly employed by the manufacturer of temperature control equipment. Bids by wholesalers, Contractors or any firm whose established business is not that of installing automatic temperature control systems are not acceptable.

i. Coordinate shut down requirement of unit with Fire Alarm Contractor. Mechanical Contractor to make required connection inside HVAC units as required.

C. Acceptable Control Systems: ALC-Web CTRLL test version/Alamo Controls, Contact: Dennis Aramil (512)848-9180.

1.02 SUBMITTALS

A. Data Sheets for all control systems and components.

B. Submit detailed sequence of operation, including set points.

C. Submit damper schedule showing size, configuration, capacity and location of each.

D. Submit control system drawings containing pertinent data to provide a functional operating system, including a written sequence of operation easily recognized as that specified. Submit detailed shop drawings in as-built form upon project completion. Show each system complete on one drawing.

E. An operator's manual which will include detailed instructions for all operations.

F. An operator's reference table listing the addresses of all connected input points, output points and unguarded software parameters. Settings shall be shown where applicable.

G. Submit specification sheets documenting the presence in each DDC controller of all specified control modes and energy management programs listed under the DDC controller specification. This software shall be resident in each controller for future use even if not applied in the sequence of operation.

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H. Prior to occupancy by user, provide control diagrams for all systems approximately 12" X 18" in size, reduced from the as-built control drawings and laminated in heavy clear plastic, two copies of each, with one copy in a ring binder and the other copy located inside its applicable control panel door.

1.03 ADJUSTMENT

A. **Upon completion of the project, adjust and validate all sensors, controllers, damper operators, relays, etc., provided under this section. Place controls in proper operating order while working in close coordination with the Mechanical Contractor, Testing & Balancing Agency and then demonstrate to the satisfaction of the Mechanical Contractor, Engineer and Owner that the control system actually makes the controlled equipment perform the sequences specified and are functioning in perfect operating order. Point to point checkout of the controls do not satisfy this requirement**.

1.04 INSTRUCTION

A. Provide operation and maintenance manuals per Section 20 00 00 covering the function and operation of the control systems on the project. Obtain written certification that this instruction period has taken place. Instruction session should only occur after all as-built drawings have been completed and all documentation concerning control programs, control point indications and other pertinent data necessary for the operation of the control system has been organized in a manual for the Owner.

1.05 GUARANTEE

A. Upon acceptance of the building by the Owner or use of the equipment by the Owner for its intended purpose, whichever occurs first, a warranty period of one year commences. The warranty consists of providing, at no additional cost to the Owner, parts and labor as required to repair or replace such parts of the temperature control system that prove inoperative or faulty due to defective materials, control system design, or installation practices. This warranty excludes routine service.

B. Upon completion of the installation the Contractor shall inspect, check, regulate, and adjust the control system and certify that they are installed in accordance with "record drawings."

C. Factory trained employees of the manufacturer located in the Austin office shall perform all maintenance and guarantee work and shall respond within four hours of notification during normal working hours.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide a direct digital electronic Automatic Temperature Control System. The system shall consist of Native BACnet Direct Digital Control (DDC) systems for the HVAC equipment, a local operator's terminal with keyboard for communication with and programming of the distributive memory in the direct digital controllers, and shall incorporate all equipment necessary to provide the sequence of operation hereinafter specified and as shown on the plans. All digital equipment designed to provide protection against interference by external voltages when operated in a commercial environment. All literature shall so note and all equipment shall be so labeled to show this compliance. This system shall use electronic temperature and humidity sensors, etc. interfaced through standalone DDC controllers and

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unitary controllers. The standalone DDC controllers shall be configured so that a portable operator's terminal (laptop computer) may be plugged in to monitor and adjust any or all unitary controllers. System is to also be accessible through password protected internet access, without requiring additional software. If system is specified as “Web Access”, Internet access is to be password protected with no additional software required.

B. All temperature control devices shall be standard catalog products and shall essentially duplicate equipment which has been in satisfactory service for at least 1 year. A minimum of 90% of the control equipment shall be manufactured by the installing manufacturer. The equipment guarantee on all equipment shall be by the installing manufacturer.

C. OPEN INTEROPERABLE, INTEGRATED ARCHITECTURES

1. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate both the ANSI/ASHRAE Standard 135-2004 BACnet.

2. All components and controllers supplied under this contract shall be true “peer-to-peer” communicating devices. Components or controllers requiring “polling” by a host to pass data will not be acceptable.

2.02 ELECTRICAL WORK

A. All electrical installation work related to the temperature control system, including the electrical interlocks required to provide the control sequences specified herein and not specifically specified in Division 26-28 or shown on the electrical drawings shall be the responsibility of the Controls Contractor. Electrical work performed under this section shall conform with all requirements of Section 26-28 of these specifications with the following exceptions as to wire type and minimum size:

1. Interlock: #16 Ga, 600 volt THHN insulation.

2. “DDC” Communication Bus: As recommended by the control manufacturer.

3. “DDC” Digital Sensors: As recommended by the control manufacturer.

4. “DDC” Analog Sensors: As recommended by the control manufacturer.

B. All required power, control wiring, conduit to control cabinets and DDC equipment, operators, etc. shall be provided under this Division of the specifications. Coordinate with Electrical Contractor for available space in panels.

C. CONTROLS CONTRACTOR SHALL PROVIDE: ALL CONTROL WIRING. ALL CONTROL WIRING TO BE PLENUM RATED TYPE. CONDUIT FROM JUNCTION BOX IN WALL FOR SENSORS TO ABOVE ACCESSIBLE CEILING LINE AND EXTERIOR CONTROL CONDUIT IS PROVIDED AND INSTALLED BY ELECTRICAL CONTRACTOR. CONTROLS CONTRACTOR TO PROVIDE AND INSTALL ALL EXPOSED CONDUIT WITHIN BUILDING AS REQUIRED. CONTROL WIRING CAN BE NEATLY RUN WITHOUT CONDUIT IN ACCESSIBLE CEILING CAVITIES.

D. Electrical Contractor to provide 120V, 20 Amp dedicated circuit to main processor on site and install telephone line next to receptacle. Coordinate final location of power and telephone with Electrical Contractor.

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2.03 MOTORIZED DAMPERS

A. All control dampers, except smoke and fire/smoke dampers shall be furnished by the temperature control manufacturer, except those specified to be furnished with an air handling unit, exhaust fan or other equipment. Smoke dampers and combination fire/smoke dampers with electric actuators shall be furnished and installed by the Sheetmetal Contractor. The Electrical Contractor shall furnish and install all interlock equipment to interlock the smoke and fire/smoke dampers with fire alarm system as hereinafter specified.

B. Damper frames minimum 13 gauge sheetmetal or steel channel suitable for application (with flanges for duct mounting as required).

C. Damper blades minimum 16 gauge and shall not exceed eight inches (8") in width and shall be suitable for high velocity performance.

D. All damper bearings are to be made of nylon. Bushings that turn in the bearings are to be oil impregnated sintered metal. Replaceable butyl rubber seals are to be provided with the damper. Seals are to be installed along the top, bottom, and sides of the frame and along each blade edge. Seals shall provide a tight closing, low leakage damper.

E. Linkage, which shall provide a linear flow characteristic, shall be provided with the damper operator for all applications (constant pressure drop).

F. Leakage shall meet Class 3 requirements for low pressure ductwork.

G. Leakage and flow characteristic charts must be submitted to the Engineer.

2.04 DAMPER OPERATORS

A. Damper operators shall be modulating electronic type with bracket arrangements for location outside the air stream wherever possible. All dampers of sufficient size to operate their respective dampers or group of dampers.

B. Mount operator outside the air stream wherever possible.

C. Provide external adjustable stops to limit stroke.

2.05 CORROSION RESISTANT FINISH

A. Provide a special factory applied corrosion resistant finish all dampers, damper actuators, system mounted controls, valves, room instruments, transmitters, etc., with exposed surfaces subject to corrosion.

2.06 BUILDING CONTROLLER (BC)

A. Building Controllers shall combine both network routing functions and control functions into a single unit. BC’s shall route communications between the BACnet/IP network, the BACnet 8802.3 network, BACnet PTP network and the BACnet MS/TP network. The BC shall be responsible for monitoring and controlling directly connected HVAC equipment such as large AHU’s, Chillers or Boilers. A sufficient number of BC’s shall be supplied to fully meet the requirements of this specification. Each BC shall be classified as a “native” BACnet device, supporting the BACnet Building Controller (B-BC) profile. BC’s shall be tested and certified by the BACnet Testing Laboratory (BTL) as Building Controllers .

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B. Hardware Specifications

1. Memory: The operating system and the application programs for the BC shall be stored in non-volatile FLASH memory. The BC shall support up to 64 MB Flash memory and up to 256 MB of RAM.

2. Communication Ports: Each BC shall provide communication to both the Workstation(s) and the field buses. The BC shall have on-board a 10/100bT Ethernet port, an RS-232 Port and two RS-485 ports. It shall support communications to a maximum of 254 MS/TP master devices.

3. Modular Expandability: The system shall employ a modular I/O field interface (sensors, actuators, etc.) design to allow easy expansion of the field interface device Input and Output capacity. It shall be possible to add I/O modules as desired to meet the I/O requirements for individual control applications. These modules shall be capable of being installed up to 100 feet from the BC.

4. Inputs: The BC shall have 16 on-board universal inputs with a minimum of 12-bit analog to digital conversion. Each input shall have over-voltage protection.

5. Outputs: The BC shall have 16 on-board universal outputs with a 12-bit digital to analog conversion. Each output shall have optional three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall provide feedback to the controller so that the Auto or non-Auto position of the override switch can be obtained through software. In addition each analog output manual override switch shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.

6. Optional output cards all with Hand-Off-Auto switches and switch feedback for the following outputs:

   a. 24 VAC Zero crossing Triac

   b. N.C. Form A relay output

   c. N.O. Form A relay output

   d. 4-20ma with override potentiometer

   e. 0-10VDC analog output with override potentiometer

7. Local Status Indicator Lamps: Provide as a minimum, LED indication of CPU status, Ethernet LAN status, and field bus status. For each output module with an optional override card, provide an LED that gives a visual indication of what state it is in (Manual or Auto).

8. Real Time Clock (RTC): Each BC shall include a battery or capacitor backed, real time clock for 72 hours, accurate to 1.5 minutes per month. The RTC shall provide the following: time of day, day, month, year, and day of week. The system shall automatically correct for daylight savings time and leap years.

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9. Power Supply: The power supply for the BC's shall be 24 volts AC (-15%, +20%, 25 VA max.) power. Line voltage below the operating range of the system shall be considered outages. The controller shall have over voltage surge protection without additional AC power signal conditioning. The BC shall have an optional UPS.

10. Automatic Restart after Power Failure: Upon restoration of power after an outage, the BC shall automatically and without human intervention: update all monitored functions; resume operation based on current synchronized time and status, and implement special start-up strategies as required.

11. Battery backup: The BC shall include an on-board battery to back up the controller's RAM memory. In the case of a power failure, the BC shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the BC shall restart itself from its application program stored in its FLASH memory.

C. Software Specifications

1. General: The BC shall contain FLASH memory to store both the resident operating system and application programming. Each BC shall be capable of parallel processing, executing all control programs simultaneously. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, routing communications, etc.

2. User Programming Language: The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and set points. The source program shall be English language-based and programmable by the user. The language shall be self-documenting, allow users to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings. Controllers that use a "canned" program method will not be accepted.

D. Control Software

1. The BC shall have the ability to perform the following pre-tested control algorithms:

a. Proportional, Integral plus Derivative Control (PID)

b. Two Position Control

c. Digital Filter

d. Ratio Calculator

e. Equipment Cycling Protection

2. Mathematical Functions: Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, trigonometric functions, Boolean logic statements, or combinations of all. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

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3. Energy Management Applications: BC's shall perform all of the following energy management routines as required:

   a. Time of Day Scheduling

   b. Calendar Based Scheduling

   c. Holiday Scheduling

   d. Exception Scheduling

   e. Temporary Schedule Overrides

   f. Optimal Start

   g. Optimal Stop

   h. Night Setback Control

   i. Peak Demand Limiting

   j. Temperature Compensated Duty Cycling

   k. CFM Tracking

   l. Heating/Cooling Interlock

   m. Hot/Cold/Outside Air Deck Reset

   n. Free Cooling

   o. Heating Water Reset

   p. Chilled Water Reset

   q. Condenser Water Reset

   r. Chiller Sequencing

E. History Logging: Each controller shall be capable of locally logging any input, output, calculated value, etc. over user defined time intervals (1 second minimum time). Up to 256 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

F. Alarm Management: For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the BC and can result in the display of one or more alarm messages or reports. Up to 8 alarms can be configured for each point in the controller. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the BC. When communications return, the alarm will be transmitted to the Operator Workstation. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

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G. Router Function: The BC shall be capable of routing traffic between two BACnet MS/TP ports, one BACnet PTP (Point to Point) port, four (logical) BACnet IP ports and one (logical) BACnet Ethernet port. The BC shall support BACnet IP Foreign Device Registration and BACnet Broadcast Management Device (BBMD). The BC shall support PTP modem communications and perform IP Packet Assembling/Disassembling (PAD) Routing for up to four BACnet IP PAD networks.

H. Standard Features: Each BC shall have the following standard features:

1. Each of the four BACnet IP ports can be configured for BACnet IP, BBMD, Foreign Device Registration, or PAD.

2. The Firmware shall be upgradeable through the Ethernet connection via FTP without physical access to the BC for easy updates as future enhancements expand functionality.

3. 16 on-board universal inputs and 16 on-board universal outputs, software selectable as either analog or binary.

4. The BC shall be capable of accepting up to seven additional expansion I/O cards.

5. BC shall accept expansion I/O modules capable of connection with twisted pair wire up to 100 feet from the BC.

6. Dynamic allocation of memory resources to provide flexible memory use.

7. Ability to contain up to 32 user defined control programs.

8. Utilize at minimum, a 32-bit microprocessor.

9. Meets or exceed the specifications in the ANSI/ASHRAE BACnet Standard 135-2004 for BACnet Building Controllers.

10. Employ removable screw terminal blocks that can accommodate wire sizes 14-22 AWG.

11. Support pulse counting up to 16 Hz.

12. Support direct connections up to 128 inputs, 72 outputs and 128 accumulator objects.

13. Support up to 1000 Analog Value Objects, 1000 Binary Value Objects and up to 256 Multi-state Value Objects.

14. Support up to 32 Loop Objects, up to 32 Program Objects, up to 32 Schedule Objects and up to 32 Calendar Objects.

15. Shall support up to 256 Trend Objects.

2.07 ADVANCED APPLICATION BACnet CONTROLLER

A. Controls shall be microprocessor based BACnet Advanced Application Controllers (AAC) in accordance with the ANSI/ASHRAE Standard 135-2004. The Native BACnet AAC's shall be provided for ALL HVAC EQUIPMENT, including, but not limited to, Air Handling Units, Chilled

and Hot Water Control, Unit Ventilators, Fan Coils, Heat Pumps, Variable Air Volume (VAV) Terminals and be capable of stand alone operation or as part of larger system. Application control program shall reside within the respective controller. The system supplier must provide a PICS document showing the installed systems compliance level to the ANSI/ASHRAE Standard 135-2004.

B. All Native BACnet AAC's shall be fully application programmable and shall at all times maintain their BACnet compliance. Controllers offering application selection only (non-programmable) are not acceptable. All control sequences within or programmed into the BACnet AAC's shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

C. Controllers shall be mounted and wired in a suitable enclosure complete with all relays, digital to analog converters, and terminal strips as required. Controllers shall operate within the following limits:

1. Temperature: 32 to 122O F

2. Humidity: 0 to 95% RH (non-condensing)

D. Whether stand-alone or networked, the BTL Listed Advanced Application Controllers shall be used to provide direct digital control of HVAC equipment. In addition to their standalone capabilities to execute the operating sequences described later in this document, they shall also be capable to be networked in a peer-to-peer, BACnet MS/TP field network to other BACnet AAC's, or as part of a complete facilities management system which integrates multiple field networks. These controllers may be used to optimize the energy consumption by implementing various Energy Management strategies such as demand limiting, duty cycling, outside air optimization, temperature setup/setback, optimum start/stop routines, etc.

1. Standard features for all field devices features shall include:

a. Stand-alone or networked peer-to-peer capabilities as MS/TP Masters; slave devices are not acceptable.

b. BACnet MS/TP LAN with configurable baud rate from 9600 to 76.8k baud.

c. All Inputs to be Universal Inputs with 10 bit resolution- software selectable as analog or digital with standard and custom ranges. Pulse counting shall be available for all inputs up to 16Hz frequency.

d. All Outputs to be Universal Outputs with 8 bit resolution - software selectable for analog or digital with standard and custom ranges

e. 40 BV points and 40 AV points minimum

f. Standard P, PI, or PID BACnet Loop Objects. Minimum of 1 Loop Object for each output

g. Retains Last To Normal/To Off Normal Event for each object

h. 10 User definable program areas

i. 8 BACnet Trend Log Objects, minimum sample interval of 1 second

j. 8 BACnet Schedule Objects

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k. 3 BACnet Calendar Objects

l. BACnet Intrinsic Alarm Reporting

m. Sensor conversion tables for creating linear curves

n. Compatible with “Microprocessor Based Space Sensor” specified below

2. BACnet AAC’s designed to control larger HVAC equipment, the following shall apply in addition to the standard features listed above:

a. Optional output cards all with Hand-Off-Auto switches and switch feedback for the following outputs:

1) 24 VAC Zero crossing Triac

2) N.C. Form A relay output

3) N.O. Form A relay output

4) 4-20ma with override potentiometer

5) 0-10VDC analog output with override potentiometer

3. BACnet AAC’s designed specifically for package HVAC equipment , the following shall apply in addition to the standard features listed above:

a. These controllers shall be designed for applications like zone devices and packaged type including, but not limited to, rooftop package air conditioners, heat pumps, or fan coil units.

b. Programmable control basic to allow customizing of the supplied application programs to suit the desired sequences of operation described later in this document, and possible changes to adapt to changing building conditions. The ability to only change operating parameters or substitute between configurable application shall not be considered acceptable.

E. MICROPROCESSOR BASED SPACE SENSORS:

1. Sensors shall connect directly to the BACnet AAC’s and shall not utilize any of the I/O points of the controller. The space sensors shall provide a communication connection to the controller and provide access to all other devices on the BACnet bus by the Portable Operator’s Terminal (POT). Sensors whose port only allows communication with the controller to which it is connected shall not be acceptable.

2. Shall be Resistance Temperature Detector (RTD) type or platinum.

3. Space sensors are to have override buttons to provide an operator adjustable override period. (Confirm final override time setpoints with Owner.)

4. Space sensors shall provide the following capabilities:

a. Confirm final sensor type with Owner. (To match existing County controls.)

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b. Space temperature setpoint adjustment

c. Capability to view the value of any input or output in the system

d. Capability to change the value of any input, output or software point in the system

e. The above functions shall be field programmable if desired

5. Provide insulated base behind all sensors, located on any interior or exterior walls

6. All space sensors located in the Expo halls, corridors and other areas of potential abuse are to be protected with suitable heavy duty metal locking covers. Provide Owner with 10 sets of keys.

F. FIELD SENSORS AND DEVICES

1. Duct temperature sensors shall be rigid stem or averaging type as specified in the sequence of operation.

2. Outside air wall mounted sensors shall be provided with a sun shield.

3. Humidity sensors shall utilize electrical resistance changes in an absorbent solid composite to sense the relative humidity of the surrounding air. Accuracy shall be within 5% RH over the range 0%-100% RH, and within 2% RH over the range 50%-95% RH. Provide humidity sensors with a full two (2) year warranty for parts, labor and calibration maintenance. Provide calibration maintenance to keep sensor error within 2% of the initial specification.

4. Fan proof-of-flow switches

a. Shall be U.L. listed

b. Shall have adjustable set point and differential pressure.

c. Switches are to be piped to fan discharge except where fans operate at less than one inch (1") WG, they shall be piped across the fan. For fractional horsepower and non-ducted fans, relays or auxiliary contacts may be used. Maximum pressure rating shall be at least ten inches (10") WG.G.

G. CONTROLLER APPLICATIONS:

1. Unit controllers shall support, but not be limited to, the following types of systems to address specific applications described in the “Execution” portion of this specification, and for future expansion:

a. Unit Vents (ASHRAE Cycle I, II, III or W)

b. Packaged Rooftops: as required

c. Split Systems: as required.

d. Make-up Air Units: as required.

e. If humidity control required, as required

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2. Controllers shall support the following types of point inputs and outputs:

   a. Outdoor Air Switchover Inputs:

      1) Dry bulb

   b. Outdoor Air Outputs:

      1) Integrated analog with minimum position

   c. Heating and Cooling Outputs:

      1) 1 to 4 Stages of heating and cooling as required by equipment

      2) Analog Output (4-20 ma)

      3) Reversing Valve Logic for heat pumps.

   d. Fan Output:

      1) On/Off Logic Control

   e. Occupied/unoccupied dry contact

   f. Humidity outputs as required

   g. Provide controllers with required quantity of analog and digital points. No sequencers, pulse width modulation or other methods of expanding points are allowed.

3. Controllers shall support the following library of control strategies to address the requirements of the sequences described in the “Execution” portion of this specification, and for future expansion:

   a. Daily Schedules

   b. Comfort/Occupancy Mode

   c. Economy Mode

   d. Standby Mode

   e. Unoccupied

   f. Shutdown

   g. Temporary Override Mode

      1) Temporary Comfort Mode (Occupancy-based control)

      2) Boost (Occupant warmer/cooler control)

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h. Occupancy-based Economy/Comfort Mode Control: Each controller shall have a provision for occupancy sensing overrides. Based upon the contact status of a manual 2 hour override switch on the temperature sensor or an occupancy sensing device, the unitary controller shall automatically select either an Economy or Comfort Mode.

i. Lighting Control: Provide binary outputs as required to control exterior lighting circuits on a time based schedule. Provide override for each circuit. Each circuit is to have individually adjustable time schedule. Coordinate lighting controls with electrical drawings.

j. Temporary Override Modes:

1) Temporary Occupancy Mode: The controller interface to the zone temperature sensor shall allow for an optional momentary switch to change the mode of the controller from economy to comfort for a preset amount of time.

2) Boost Mode: The controller interface to the zone temperature sensor shall allow for an optional momentary switch to override the controller's output to full heating or cooling. This command shall be active for a preset amount of time, to anticipate a substantial change in the room's load.

k. Alarm Management: Each unitary controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing necessary communications.

l. Points:

1) Provide all points as required by sequence of operation for the actual equipment being controlled. For each RTU, AHU and exhaust fan provide individual points for occupied/unoccupied, start/stop, status, space temperature, supply air temperature, compressor status, heat status and override. Also provide space humidity points as required. All to be adjustable from unitary controller terminal via laptop computer, site computer or main computer at the school districts main office.

m. Site Computer:

1) Provide a site computer system as follows: Provide one Dell Laptop Latitude, 14.1 wide screen, 1 Gig Ram, Intel Core 2 Duo Processor, wireless card, minimum 80 Gig hard drive, Window XP Professional, CD-RW/DVD Combo Drive and all required software. Also provide one Dell desktop computer system with minimum 24” flat panel monitor and all items listed for laptop as minimum.

2) Contractor to insure system is capable of pulling up at Engineer’s office.

H. GRAPHICS

1. The Graphics shall make extensive use of color to communicate information related to set-points and comfort, and shall comply with the following:

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a. Dynamic Color Graphic Displays

1) Create Site Layout Color graphic including building penetration Icons, building floor plan displays with room temperatures and other building sensors values dynamically displayed. Icon links on the floor plans will allow penetration to the building Mechanical equipment. Provide System graphics for each piece of mechanical equipment, including all types of air handling units, (RTU's & AHU's) as applicable, with dispersed dynamic data as indicated in the system point I/O summary of this specification. Points required by the sequence of operations shall also be displayed even if they are not defined by the I/O schedule to optimize system performance analysis and speed alarm recognition. Provide as a minimum the following graphics:

a) Site layout

b) Building Floor plans

c) Individual AHU graphics

d) AHU, RTU and EF, etc., shall be shown on the floor plans, clicking on the device will display all data associated with the device.

e) All graphics will provide in addition to the system points the following. They are:

i. Outside air temperatures

ii. Outside air humidity

(a) Submit graphics for approval prior to system checkout.

2) Create site plan indicating control of exterior lights and floor plan indicating control for interior spaces. Reference electrical drawings for additional information.

b. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based commands. Graphics software shall permit the importing of Auto-cad or Bitmap drawings for use in the system.

c. Temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates.

1) Analog sliders or rotating knobs shall be available for monitor and control of analog values; high and low alarm limit settings shall be available and displayed separately. The user shall be able to "click and drag" the pointer to change the set point.

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2) Provide the user the ability to display blocks of point data by defined point groups; alarm conditions shall be displayed by flashing point blocks.

3) Equipment state can be changed by clicking on the graphic symbol and selecting the new state (on /off) or set point.

4) Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable. (Green-OK, Light Blue – slightly cool to Dark Blue for very cool, Yellow – slightly warm, Orange - very warm).

5) The windowing environment of the PC operator workstation shall allow the users to simultaneously view several applications at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.

6) Off the shelf graphic/photo bitmap editing software, shall be provided to allow the user to add, modify or delete system graphic displays.

7) A library of static and animated HVAC and automation symbols shall be provided including fans, valves, motors, Chillers, AHU systems, standard ductwork diagrams and laboratory symbols that pertain to each project specific. The user shall have the ability to add custom symbols to the library.

a) 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.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate this work with the work of other trades, and make arrangements for the complete and proper accomplishment of all related work. The following division of responsibility is suggested:

1. The Mechanical Contractor:

a. Installs smoke duct detector in ductwork. Provided by the Fire Alarm Contractor. Final connection by the Fire Alarm Contractor. Install smoke detectors in R/A ahead of any fresh air inlet and in supply air discharge or as required by code.

b. Installs all automatic dampers and provides blank-off plates or transitions required to install dampers that are smaller than duct size.

c. Assemble multiple sectioned dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper motors.

d. Provide sheetmetal baffle plates to eliminate stratification and provide air volumes specified. Locates baffles by experimentation and fix and seal permanently in place only after stratification problems have been eliminated.

e. Provide access doors or other approved means of access through ducts for service to control equipment.

2. The Controls Contractor:

a. Furnish all control products to accomplish the specified sequences of operation for mechanical systems and lighting systems, except those products specifically furnished under other sections.

b. Install all control products and connections, except where other arrangements have been made, as above.

c. Provide and install control step down transformers and wiring at all equipment required for system control operation.

d. Control Contractor to connect all controllers, sensors, devices and modular controller for a complete and operational system.

e. CONTROL CONTRACTOR IS REQUIRED TO DO A COMPLETE OPERATIONAL CHECKOUT OF HVAC EQUIPMENT BY MANIPULATING THE CONTROL SYSTEM TO MAKE SURE THE SYSTEM IS PROPERLY INTEGRATED AND THAT THE EQUIPMENT ACTUALLY DOES WHAT THE CONTROLS COMMAND IT TO DO, IN ALL MODES OF OPERATION. CONTROLS CONTRACTOR MUST DEMONSTRATE THIS TO THE OWNERS AND MECHANICAL CONTRACTORS SATISFACTION.

f. Control contractor is to set up any OEM unit mounted controller (ie, similar to Lennox integrated modular controller ECTO settings, etc) to properly mesh with the DDC system that will be installed. Control contractor MUST provide a written record of original settings from factory and changes made to settings to make the equipment mesh with the DDC system. Include these setting changes in "as built" control drawings.

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g. Any time equipment being installed requires a separate, dry contact to be opened/closed to tell its' internal controller whether it is in an unoccupied or occupied mode, the Control Contractor must provide it. If unit has a factory jumper wire where this dry contact goes, the factory jumper must be removed.

3.02 INSTALLATION

A. Fasten all equipment securely to structure. Install equipment and conduit parallel to building lines, plumb and level.

B. Fasten conduit 5'-0" on centers where exposed; on 10'-0" maximum centers where concealed.

C. ROUTE CONDUIT TO BE OUT OF ACCESS WAYS, AND IN MANNER NOT INTERFERING WITH SERVICE OF EQUIPMENT.

D. Provide wood trim for any semi-recessed panels. Coordinate with the General Contractor and verify finishes with Architect/Owner.

3.03 SEQUENCE OF OPERATION

A. Clearly write the "Sequence of Operation" in narrative form easily recognized as the sequence specified. Provide complete control systems operating with the following sequences:

B. RTU:

1. Occupied Mode: Equipment serving Office Meeting Area is to start at 7:30 a.m. and cycle off at 5:30 p.m. (adjustable). Equipment serving Expo areas is to start at times selected by Owner. Temperature sensors are to maintain space conditions. Initially set for 70 degrees (adj) heat and 74 degrees (adj) cooling. Supply air sensor readings are used for trouble shooting. Confirm final scheduling and heating and cooling setpoints with Owner. Some units have hot gas reheat. On those units the humidity sensors in space will cause the air-conditioning unit to go into humidity control sequence if space humidity exceeds 60%RH (adjustable). Dehumidification is to be locked out if space temperature falls below 70 degrees. Coordinate sequences and control requirement with unit manufacturer. On RTU's with motorized outside air dampers, the outside air damper is to be open during occupied mode and closed during unoccupied mode. Some outside air dampers are further controlled by space or return mounted CO2 sensors. See equipment schedule. Multi-stage units are to bring on additional stages of heating or cooling as required to maintain building temperature within two degrees F. of set point. The multiple stages are also to deactivate in sequence as the set point temperature is approached. Heat is to be locked off when outside air temperature exceeds 70 degrees (adj). Cooling is to be locked out when outside air temperature falls below 45 degrees (adj) on all units except those serving computer or MDF/IDF rooms. Fans on AHU's and/or RTU's may be set to cycle with call for sensible heating/cooling or to run continuously during the occupied mode.

2. Night Setback (Unoccupied Mode): Space sensor is automatically reset back to a night setback temperature during unoccupied mode. If the space drops below the night setback temperature, the associated air handling unit is energized. Once the space night setback temperature is satisfied, the air handling unit is de-energized. Night setback temperature: 60 F. heating, 85 F. cooling (adjustable). Confirm final setpoints with Owner.

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3. Morning Start-up Mode: Morning Start-up Mode starts one (1) hour before occupied mode. Provide heavy equipment delay start to prevent simultaneous starting of HVAC equipment.

4. Humidity Control Sequence:

a. Rooftop Units With Hot Gas Reheat:
During occupied mode when building humidity exceeds 60% RH (adjustable) and no call for sensible heating or cooling exists, the dehumidistat will override the thermostat and bring on the first stage of cooling and simultaneously energize the solenoid valve that activates the hot gas reheat coil to prevent the space from over cooling. On a call for sensible space cooling or heating or when space humidity drops to below humidistat setpoint, normal operation is to resume. Dehumidification is to be locked out if space temperature falls below 70 degrees.

C. Water Heaters:

1. Provided with factory controls to maintain temperature.

2. Provide control to operate domestic hot water circulation pump (HWRP) to run continuously during the school season and be off during non-school unoccupied periods. Control by building energy management system.

D. Unit Heaters: Control by wall thermostat.

E. Exhaust Fan Control:
1. For control of fans, reference the fan schedule.

F. Provide temperature sensors for freezer, cooler and dry storage areas and interface with control system for monitoring.

G. Provide door switch for freezer and cooler and interface controls.

H. Provide red button mushroom switch located next to FACP for shutdown of all HVAC equipment. Provide hinged plastic protective cover. Label switch. Verify final location prior to rough-in.

I. Reference mechanical equipment schedule for units with CO_2 monitoring.

J. DDC system shall monitor supply and return air temperature for each HEATING/COOLING system and indicate when units with HOT GAS REHEAT option go into dehumidification mode.

END OF SECTION

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PROJECT NAME

SSECTION 23 11 26 - FUEL GAS SYSTEMS (LP)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description: This section describes specific requirements, products and methods of execution relating to the provision of Fuel Gas Systems for the project.

B. Scope: Provide all products, including above and below ground piping, all connection to gas burning apparatus and all work at the gas source to provide a complete system.

C. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

1.02 APPLICABLE CODES

A. Provide all products and installation in strict accordance with the following:

1. Safety Rules Liquified Petroleum Gas Division (Railroad Comm. of Texas.)

2. Codes listed in Section 20 00 00.

B. Persons or firms must be licensed by or approved by the Railroad Commission of Texas.

1.03 CONNECTION POINT

A. The [school district] [specify] will provide the LP gas tank, regulator assembly and service piping up to the building. Coordinate with the [school district tank and piping] installer to establish the precise tank location, and to properly integrate their work with the other work of the project. Provide the stub connection outside the building for connection of LP gas service. Make final connection at the building using appropriate materials, compatible joints, supports and all other products for proper interface.

B. Contractor to provide copy of LP gas license and expiration date of license on LP gas stub up points.

PART 2 - PRODUCTS

2.01 PIPING ABOVE GROUND

A. Welded Schedule 40 black steel piping and fittings (2-1/2” and over).

B. Schedule 40 black steel piping with schedule 40 black steel malleable iron threaded fittings (2” and under).

C. No galvanized piping or fittings allowed.

PROJECT NAME

2.02 MISCELLANEOUS PRODUCTS IN CONTACT WITH GAS

A. Provide line-size, level-handle, stopcock of type designated and approved for handling gas at each gas-consuming appliance.

B. All products bear the label for the use intended.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Arrange all products to be readily accessible for inspection, testing, and shutting off gas supply.

B. Install all pipe and fitting clean and free from cuttings, burrs, and defects in structure or threading, and thoroughly brushed and scale blown.

C. All gas piping 2-1/2” and larger shall be welded (by certified welder). Use chill rings throughout.

D. Do not install any building service low pressure piping in concrete, in masonry or below grade. Route piping to science lab tables in service trench in slab.

E. Provide stopcock and connection at all gas consuming appliances.

F. Pipe or tubing shall not be installed in the same stud space with electrical junction boxes or switches.

G. Grade all piping at a minimum 1/4” to 10 feet so any possible condensate will drain to underground piping.

H. Support piping 1/2” and less at 6 feet O.C., 3/4” and larger at 8 feet O.C.

I. Prime and paint all exposed gas piping. Riser to match building. Refer to Architectural painting specification.

J. Provide additional support of gas piping run exposed in areas to prevent sway.

K. Gas piping installed in concealed locations shall not have unions, tubing fittings, right and left couplings, bushings, compression couplings or swing joints.

L. Appliance connectors must be listed and labeled for use with food service equipment.

3.02 TESTING

A. Test all gas piping before connection to the gas source. Do not enclose or conceal any untested portion of the gas system.

B. Test all piping in accordance with Texas Railroad Commission Safety Rules and repair all leaks.

C. Obtain a certification of final inspection from the Texas Railroad Commission.

END OF SECTION

PROJECT NAME

SECTION 23 30 00 - AIR DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description: This section describes specific requirements, products and methods of execution relating to the project air distribution systems.

B. Provide all air distribution systems as shown and specified, complete in every detail and in perfect operating order.

C. All equipment warranties to be per Specification Section 20 00 00, 1.17.

D. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

1.02 Provide all air distribution work in accordance with the minimum provisions of the latest approved editions of the following codes and standards.

A. NFPA 90 A - Air Conditioning and Ventilating Systems.

B. NFPA 90 B - Warm Air Heating and Air Conditioning.

C. SMACNA - Low Velocity Duct Construction Standards.

D. TIMA - Fibrous Glass Duct Construction Standards.

E. SMACNA - Duct Liner Application Standard.

F. SMACNA - Ducted Electric Heat Guide.

G. AMCA Standard 210-74 Laboratory Methods of Testing Fans for Rating Purposes.

H. AMCA Pub. 261 Directory or Products Licensed to Bear the AMCA Certified Rating Seal.

I. AMCA Standard 300-67 Test Code for Sound Rating.

J. AMCA Standard 301-65 Method of Publishing Sound Ratings for Air Moving Devices.

K. AMCA Publication 511-75 Certified Ratings Program for Louvers, Dampers and Shutters.

L. ASHRAE Standard 52-76 Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

M. ASHRAE Standard 70-72 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

1.03 Where any references to “sheetmetal work” or “ductwork” appears in this section of these specifications or on the drawings, it shall be construed to include outside air ducts, supply air ducts, return air ducts, exhaust ducts, relief ducts, plenums, duct taps, grille taps, diffuser connections and all other related pieces and parts of the air conveying systems.

1.04 Before starting shop drawings or fabrication of any duct work, the Contractor must have an approved reflected ceiling plan with which he can coordinate location of air outlets, lights, grille patterns, etc.

PART 2 - PRODUCTS

2.01 FANS

A. General Requirements for All Fans:

1. All fans constructed to AMCA Standards, AMCA listed and labeled.

2. Bearings:

a. At factory assembled package units 1HP and larger, provide 200,000 hour bearings (AFBMA L-50) selected at maximum fan rpm.

b. At packaged equipment 3/4HP and smaller, provide manufacturer's standard bearings.

c. Arrange equipment for easy access to lubrication fittings. Provide extended grease lines whenever easy access is not possible.

3. Balance fans statically and dynamically at factory.

4. Factory paint fan housing, fan wheel (except aluminum), frame and support brackets with prime coat and enamel finish coat at factory, after properly preparing surfaces.

5. Arrange fans to be cleanable and so that wheel, bearings, shaft, and drive are removable. Provide plug type cleanout doors or split fan housing. Gasket joints and bolt airtight.

6. Provide vibration isolation for all fans per manufacturer's recommendations.

7. Assemble fans at factory and test with permanent motor for proper operation, alignment and balance.

8. **All fans are to be of similar size and operational characteristics as fans scheduled. Smaller fans run at higher speeds will not be accepted.**

9. All Exhaust and Make-up Air fans to have dampers. If backdraft dampers are not provided as an integral part of the fan provide a motorized parallel blade damper, the operator voltage / phase to match the voltage / phase of the fan that it is serving. If the voltage / phase cannot be matched provide transformers, relays, etc. required to interlock the damper with the fan.

B. Belt Drives (All Belt Driven Fans):

1. Provide V-belt drive with sufficient belts to prevent slipping at start-up. Select drive for 1.5 service factor.

2. On each fan 10HP and smaller, provide variable pitch drive sheave with infinitely adjustable pitch diameter. Select drive sheave and fan pulley combination to provide fan rpm with drive adjusted to near mid-span.

3. On each fan 10HP and larger, provide a fixed speed drive sheave. Change fan and drive sheave in field to attain specified air delivery at completion of balancing.

4. Provide belt guard with hinged tachometer cap.

C. Roof Mounted Exhaust Fans:

1. Direct drive or have adjustable pitch v-belt AS SCHEDULED.

2. Wheels shall be backward curved and housing shall be removable or hinged aluminum.

3. Isolate motor with vibration dampeners.

4. Provide with motorized backdraft dampers unless gravity backdraft dampers are specifically listed on schedule. Damper actuator voltage to match fan voltage. Electrical Contractor to tie damper in to fan power.

5. Insulated, pre-fabricated metal roof curb shall be for flat or sloped roof as required for fan to be set level on roof.

6. Provide with galvanized bee screen.

7. Maximum motor rpm is not to exceed scheduled rpm by more than 50 rpm.

8. Provide with 12” high roof curb to match roof slope. Curb to minimum of 12” above finished roof.

9. Manufacturers: Greenheck, Acme, ILG, Penn, Briedert, Carnes and Twin City.

D. Ceiling Exhaust Fans:

1. Centrifugal wheel with inlet perpendicular to, or remote from, inlet grille. Acoustically insulated housing.

2. 85% free open area grille.

3. Electrical junction box on fan housing with cord, plug, and receptacle inside housing.

4. Fan, motor and wheel assembly removable through grille without disturbing housing.

5. Motor mounted on rubber-in-sheer isolators, grounded, maximum rpm shall not exceed scheduled rpm by more than 50 rpm.

6. Unit supplied with grille when indicated by model number scheduled.

7. Provide and install roof cap or wall cap as shown.

8. Unit UL labeled.

9. Integral backdraft damper, shatterproof, with no metal to metal contact.

10. Manufacturers: Greenheck, Acme, ILG, Penn, Briedert, Carnes and Twin City.

E. Utility Sets:

1. Direct drive or adjustable pitch V-belt as scheduled.

2. B. I., Airfoil or Radial Wheel as scheduled.

3. Configured as scheduled.

4. Provide with access panel and drain.

5. Provide weather cover when fan is located outdoors.

[6. Provide with three foot (3') high "no loss" discharge stack with butterfly damper.]

[7. Provide with Pate Universal Curb Model PUC-2 with full CDX plywood deck and galvanized steel counterflashing cover with optional duct opening.]

8. Manufacturers: Greenheck, Acme, N.Y.B., Aerovent, Trane, Barry, Delhi, and Twin City.

2.02 FAN ACCESSORIES

A. Flexible Fan Connectors:

1. Provide at inlet and discharge of each fan, ERV, MAU, air handling unit, etc.

a. For Standard Application:

1) Material suitable to withstand the pressure encountered. Constructed from coated heavy glass fabric, flameproof and ozone resistant. Joints to be sealed airtight. Minimum of 3" flex connection to be used.

2) Manufacturer: Duro-dyne Corporation "EXCELON" or equal.

b. For Outdoor Installations and Where Duct is Exposed to Toxic Fumes:

1) Material suitable to withstand the pressure encountered. Constructed from heavy glass fabric, double coated with "Neoprene", non-combustible and fire retardant. Fabric to be waterproof and airtight. Minimum of 4" flex connection to be used.

2) Manufacturer: Duro-dyne Corporation Duralon or equal.

2. Insulate over flex connection at inlet and discharge of all air handling units and rooftop units with minimum two inch (2") Type "C" insulation with minimum installed "R" value of 6.0. Seal termination of external insulation to ductwork with Childers CP-11 mastic with 3" glass fiber reinforcing mesh. Do not seal over any access panels.

2.03 DUCTWORK

A. Low Velocity Ductwork Systems:

1. Definition: Ductwork systems where duct pressures do not exceed 2" W.G. maximum static pressure and duct velocity does not exceed 2000 FPM. **Minimum duct gauge to be 26 gauge.**

2. All ductwork connected to louvers is to be sloped back to louver to insure that any water entering the duct drains back to the exterior of the building.

3. Ductwork Construction:

   a. Ductwork, unless otherwise specified herein, shall be constructed of new, prime grade, continuous hot dip mill galvanized, lock forming quality steel sheets and shall have a galvanized coating of 1-1/4 ounces total for both sides per square foot. The gauges of metal to be used and the methods of duct construction shall conform to the requirements for the class of work involved as set forth in the latest edition of “Standard Practice in Mechanical Sheet Metal” as published by SMACNA. Each sheet shall be stenciled with the gauge and manufacturer’s name. If coil steel is used, coils shall be stenciled throughout on ten foot (10’) centers with the gauge and manufacturer’s name. Insulate per Specification Section 20 07 00.

   b. All dimensions are inside clear dimensions. Sheet metal size shall be increased to allow for duct liner where applicable.

   c. Seal all transverse joints, seams and fitting connections with “Ductmate Proseal”, Childers CP-146 or Foster 32-19, UL listed Mastic to prevent air leakage. Oil base caulking and glazing compounds are not acceptable. Duct sealant must meet VOC units per South Coast Air Quality Management District (SCAQMD) Rule #1168.

   d. [Vehicle Exhaust: Sheet metal spiral duct. Minimum 20 gauge.]

4. Rectangular Ducts:

   a. Where special rigidity or stiffness is required, construct ducts of metal two gauge numbers heavier.

   b. Ducts larger than 96” require special field study for gauging and supporting and supporting methods. (Furnish shop drawings for supporting and construction requirements.)

   c. Rectangular low pressure ducts shall be constructed, braced and reinforced in accordance with Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

5. Round Ducts:

   a. Construct round ducts from steel sheets, U.S. Gauge thickness, per SMACNA standards.

   b. All exposed round ducts shall be double wall spiral duct per SMACNA standards with segmented fittings regardless of size.

   c. Supply, return and exhaust duct runouts to/from air device shall be gauges as follows:

      1) up to 12” diameter 30 gauge,

2) 14” to 18” diameter 28 gauge, and

3) 20” to 22” diameter 26 gauge.

Provide minimum 26 gauge, 1” wide strap on heal and throat of adjustable fitting to provide additional rigidity.

6. Transitions:

a. Provide tapered transitions at changes in duct size and at connections to fans and other equipment.

b. Offset not more than 20°, on diverging flow and 30° on contracting flow, unless called for otherwise on drawing.

7. Elbows and Turning Vanes:

a. Use long radius, 45° and 90° fittings for all elbows and at tees, unless otherwise shown or space restrictions dictate use of square elbows.

1) Construct fittings with centerline radius equal to 1-1/2 times the duct width at the turn.

2) Where square vaned elbows are used, provide access doors as detailed below.

b. Turning Vanes: In all 90° turns in supply air ducts where 1-1/2 radius elbows cannot be used, install double radius turning vanes in square elbows.

1) Ducts 19” and Smaller: Use small double vanes with an inner radius of two inches (2”) and an outer radius of one inch (1”) mounted on 3/4” center.

2) Duct 19” and Larger: Use large double vanes with an inner radius of four inches (4”) and an outer radius of two inches (2”), mounted on three (3) 1/4” centers. Provide sound reduction type turning vanes: “Airsan” Acoustiturn, by Air Filter Corporation, “Sone-Turn” by Sound Control Products Company, per SMACNA Plat 22, or equal.

3) Provide 12” x 12” insulated access door into duct on both sides of each vaned fitting to facilitate duct cleaning.

8. Flexible Duct:

a. Do not use flexible duct except where specifically called for on the plans.

b. At diffuser connections:

1) Provide duct listed as UL-181 Class I air duct, and constructed in compliance with NFPA 90A.

2) Minimum length 4 feet, maximum length 5 feet for supply ducts. Minimum length 4 feet, maximum length 5 feet for return air ducts. Install with not more than one (1) 90 full radius

degree bend. Minimum and maximum lengths are to be closely followed since the flex duct acts as the main source of sound attenuation in the air system. Install with some slack in runout.

3) Make joints with Nashua brand UL181A-P Duct Tape (Venture #1599B or Shurtape #PC857) and two (2) 1/2" wide positive locking straps, one on inner core and one on outer jacket. Use Panduit straps.

4) Minimum sound net insertion loss for duct as follows:

BAND, HZ	125	250	500	1000	2000
Loss dB/ft.	2.1	3.0	2.7	3.0	2.7

5) Submit sound and construction data for proposed alternates.

6) Tough vapor barrier reinforced metalized polyester jacket, tear and puncture resistant.

7) Airtight inner core with no fiberglass erosion into airstream.

8) **R-Value: 6.0 @ 75ºF. mean temperature if within building insulation envelope, or R-value of 8.0 if outside building insulation envelope.**

c. Do not use flex duct on exhaust systems.

d. Manufacturers: **Atco 36 Series**, Certainteed, Thermoflex, Wiremold, Genflex, approved equal.

B. Entire interior of ducts shall be thoroughly cleaned of all oil residue and dust prior to installing.

2.04 DUCT ACCESSORIES

A. Air Volume Controls:

1. Provide air volume dampers, or other control devices, at each low pressure duct main and branch for a balancer to adjust the system to produce the air quantities shown.

a. Provide opposed blade damper for balancing in each zone duct for HETD. Locate downstream of first elbow in accessible location and indicate location on record drawings.

2. Volume Dampers:

a. Flat sheet, single leaf damper with a continuous rod; damper leaf two (2) gauges (minimum 16 gauge) heavier than the duct where installed. Provide locking quadrants with indicators located accessible without demolition.

1) Use for supply, return and exhaust ductwork 14" round or 14" x 14".

b. The locking-type quadrant operators for dampers, when installed on ducts to

be thermally insulated, shall be provided with **stand-off mounting brackets, bases or adapters to provide clearance, between the duct surface and the operator, not less than the thickness of the insulation.** Stand-off mounting items shall be integral with the operator or a standard accessory of the damper manufacturer. All volume dampers indicated shall be provided with stand-off mounting brackets as required.

c. All operators accessible and lockable. Do not insulate over top of volume damper operator handle.

d. Locate dampers a minimum of 4 feet from diffusers.

3. Extractors:

a. Combination air straightening vanes and volume control with locking quadrant on outside or accessible through face of register.

b. Manufacturer: Titus AG-45 or approved equal.

c. Provide extractors at supply grilles attached directly to any main or branch duct serving more than one (1) grille.

4. Splitter Dampers:

a. Construct damper using sheetmetal blade hinge mounted inside duct.

b. Dampers or splitters shall be constructed from the same gauge metal as the ducts which they serve with a minimum of 22 gauge. Splitter length shall be 1-1/2 times the duct width up to 24” in size and above 24” in size shall be 1-1/4 times the duct width.

c. Attach Duro-dyne SRP-40 series splitter damper bracket to blade.

d. Connect 1/4” steel rod to damper bracket and extend through Duro-dyne SRP-14 ball joint damper casting mounting on outside of duct. Use 3/8” steel rod for splitter in ducts above 24” in size.

e. Install assembly for full swing of damper blade. Lock damper in proper position.

5. Opposed Blade Dampers:

a. Provide opposed blade balancing dampers with multiple blades equal to Greenheck VCD-15, 20 gauge frame and 16 gauge blade construction with synthetic axle bearings and 1/2” diameter operator, complete with 1” stand-off and manual locking quadrant as follows:

1) Use for outside air ductwork. Minimum damper size is actual duct size or 10” x 10”, whichever is larger. Provide transitions as required.

2) Use for supply, return and exhaust ductwork - 14” round or 14” x 14” and larger.

b. Damper material is to match ductwork material. (i.e., galvanized aluminum, stainless steel, etc.)

B. Gravity Backdraft Dampers:

1. Provide backdraft dampers counter balanced to desired static pressure setting. Wide open static pressure drop not to exceed 0.15” W.G.

2. Damper blades aluminum with felt applied to tops of blades. Where dampers are exposed to outside temperature, provide neoprene edged blades.

3. Damper frames extruded aluminum; nylon bearings.

4. Assembly designed for operation at 20^{o}F.

C. Access Panels and Doors:

1. Low Velocity System Access Panels:

a. Sheetmetal doors reinforced, cross-bracketed or otherwise stiffened to prevent rattle or vibration.

b. Seal doors airtight with felt edged gaskets.

c. Secure with hinges and sash locks.

d. Panels and doors for insulated duct systems are to be insulated.

2.05 GRILLES, REGISTERS AND DIFFUSERS

A. Provide grilles, registers, and diffusers of the types and sizes called for on plans and in schedule on drawings.

B. Finish with factory applied finish for extruded aluminum items, and with a prime coat for steel items. (Provide an additional factory baked enamel finish to match ceiling grid.) (Submit color sample for approval.)

C. Equip diffusers with panels of the proper size to match the suspended ceiling layout or with the proper frame for surface mounting. Fully correlate diffuser and grille style, dimension and fit with ceiling.

D. Manufacturers: Price, MetalAire, Titus, Tuttle & Bailey, Krueger, Anemostat, Carnes

E. All air devices located in damp areas are to be constructed from all aluminum components.

F. Provide minimum 12” deep externally insulated boot for sidewall type supply air devices.

G. Provide square to round transitions as required.

H. Provide minimum 12” deep (top duct tap) or 24” deep (side duct tap) externally insulated boot for return air and transfer air devices.

I. Provide minimum 12” deep boot for all exhaust devices.

2.06 LOUVERS AND HOODS

A. Provide air exhausts through building skin, as shown.

B. Louvers:

1. Size as shown; air pressure drop not to exceed 0.15” W.G. when handling 1150 FPM per square foot of free area.

2. Water penetration not to exceed .02 oz. per sq. ft. when handling 1150 FPM per square foot of free area.

3. 4” deep drainable louver constructed of .125” thick 6063-T52 extruded aluminum alloy with channel frame.

4. Provide with 1/8” X 1/8” galvanized hardware cloth bee screen.

5. Finish to be factory primed for field painting or applied .7 mil thick anodized dark bronze as directed by Architect.

6. Manufacturers: Greenheck ESD-403, Arrow, Carnes, Greenheck, Ruskin, Empco, Pottorff, or approved equal.

7. Any plenum or ductwork attached to louver is to slope to drain back through louver to exterior of building.

C. Hoods:

1. Construction of heavy duty aluminum sheets with rolled interlocking seams with galvanized hood support members, similar to Greenheck Fabrahood or equal.

2. Provide with bee screen on outside air intake hoods and 1/4” x 1/4” galvanized bird screen on relief hoods.

3. Curbs are to be a minimum of fourteen inches (14”) high above finished roof surface and match slope of roof.

4. Manufacturers: Greenheck, Acme, Penn, Cook, Briedert and Carnes.

5. Provide 120 volt motorized damper.

2.07 AIR FILTERS

A. General:

1. All air filters to be listed as Class 2 by Underwriters Laboratory, Inc., Building Materials Directory.

2. All arrestance, efficiency (dust spot efficiency on atmospheric air) and dust holding capacities specified are to be in accordance with ASHRAE Standard 52-76.

3. Performance characteristics are to be verified by certified data published in manufacturer’s literature or by copies of current test data from an independent authorized test laboratory. Test data, where required, shall be an integral component of the manufacturer’s submittal data.

4. Provide and install one (1) clean set of filters in all air moving units that require filtration at completion of project.

B. Grease Rated Filters (for all return air filter grilles located in kitchens):

1. Media: Multiple layers of aluminum sheets that are corrugated, slit then expanded into a series of baffles. Media protected on both sides by expanded aluminum grid.

2. Initial Resistance: .06" W.G. at 350 fpm.

3. Frame: Single piece of heavy gauge two inch (2") aluminum u-channel with "compression" flanges that grip the media and lock it to the frame.

4. Filter shall be washable.

5. Manufacturers: American Air Filter, mesh type grease filter or approved equal.

C. Disposable Panel Filters (for return air filter grilles and/or unit filter racks):

1. Media: Non-woven, lofted cotton bonded to 96% free area welded wire support grid. Not less than 2.45 square feet media area per square foot of filter face area. Arranged in radially pleated configuration and bonded continuously to inside perimeter of high wet-strength beverage board cell sides.

2. Cell Design: Two inches (2") deep with beverage board diagonal supports at entering air and leaving air faces of each cell.

3. Air Cleaning Performance: Minimum 25-30% efficiency 90-92% arrestance, MERV-7.

4. Initial Resistance: 0.2" W.G. at 500 fpm face velocity.

5. Dust Holding Capacity: Not less than 200 grams when operated at 500 fpm face velocity to a final resistance of .9 W.G.

6. Manufacturers: Cam-Farr Company Aeropleat II; AAF or approved equal.

D. Temporary Filters:

1. Reference 20 00 00, 3.07 for temporary filter requirements.

2.08 ELECTRIC DUCT HEATERS

A. Provide slip-in type heaters sized to fit duct shown and of capacity as scheduled, complete with control box.

B. Unit framing support bars and control box aluminized steel, and control box. Support brackets high to utilize high grade ceramic insulators. Element wire 80% nickel, 20% chromium, with a stretch ratio no less than 2 to 1.

C. Built in accessories to include magnetic contactor, control transformer UL listed, main disconnect (unfused type), auto reset and one manual reset on high temperature, fan interlock relay, and multiple staging for electric coils 5 KW and greater.

D. Provide a low pressure drop air equalizer grid in duct in front of heater.

E. Manufacturers: Electric Heaters, Inc., Gould, Indeeco, Brasch or approved equal.

2.09 UNIT HEATERS (ELECTRIC)

A. Provide UL listed electric unit heaters with voltage, phase, number of steps, heating and air delivery capacities, as scheduled. Suitable for vertical and horizontal mounting.

B. Casings fabricated of die-formed heavy gauge steel and finished in high gloss baked enamel.

C. Steel finned tubular element. Provide automatic reset thermal cutout for each element.

D. Individually adjustable discharge louvers.

E. Thermostat to match number of heater control steps. Wall mount or built-in as scheduled.

F. Provide angle support between unit heater threaded rod supports and nearest wall to prevent unit sidesway.

G. Manufacturers: Markel, Brasch, Modine, Trane, Berko or approved equal.

2.10 UNIT HEATERS (GAS)

A. Provide AGA label gas-fired unit heaters, power or gravity vented, as scheduled, arranged for ceiling suspension with threaded hanger connections and provided with hanger kits, propeller fan, open drip-proof motor with internal overloads and a safety fan guard. Horizontal directional louvers will be provided for directing air throw.

B. Unit equipped for use with natural gas and 120V power supply. Heat exchanger shall be E-3 409 stainless steel. Die-formed burners are constructed of stainless steel and include flared ports and a stainless steel insert.

C. Provide with a 24V control transformer, a single stage gas control with a regulated combination redundant gas valve and an intermittent safety pilot with electronic ignition and electronic flame supervision. The unit is to include all required limit and safety controls.

D. Provide special air recirculation kit with a manual summer switch on thermostat.

E. Provide angle support between unit heater threaded rod supports and nearest wall to prevent unit sidesway.

F. Manufacturers: Reznor, Modine, Sterling, Hastings, Trane, Lennox or approved equal.

2.11 RADIANT HEAT PANELS

A. Provide UL listed radiant heat panels with voltage, phase and wattage specified.

B. Twenty-four (24) gauge galvanized steel back overlapping and riveted to a twenty-two (22) gauge galvanized steel front with a crystalline type finish.

C. Electric resistance graphite element imbedded between two (2) layers of insulation. One (1) pound density, high temperature insulation above element; dielectric insulation below element.

D. Provide a thermostat for each panel unless noted otherwise.

E. Provide with surface mounting kit as required.

F. Manufacturers: Markel, Raywall, Berko or approved equal.

2.12 INFRARED HEATERS

A. Provide AGA label gas-fired, high-intensity, infrared heaters with capacity as scheduled on drawings.

B. Each heater shall carry a permanently affixed plate stating that the unit is designed certified by the American Gas Association (AGA) in accordance with the American National Standards Institute (ANSI) Z83.6 test standards, and also stating that the heater is approved for installation in aircraft hangers and garages when installed in accordance with National Fire Protection Association (NFPA) No. 409 and No. 88, respectively.

C. The heaters shall be of the fixed air, atmospheric type suitable for horizontal or angular mounting on the long axis in either direction from 0^{o} up to an angle of 30^{o} from the horizontal. Each heater shall consist of a stainless steel, shrouded, unitized burner housing incorporating universal mounting brackets, an integrated modular perforated “effect” ceramic combustion surface, shade assembly, shrouded enclosed protective control compartment, and a completely factory mounted and wired control manifold system incorporating a brass orifice with adaptor, a combination low-pressure appliance type gas valve/pressure regulator, test port capable of allowing the sensing of gas pressure immediately ahead of the main burner orifice.

D. Stainless steel shall be used in the fabrications of the burner housing, venturi and ceramic tile retainers. The design and manufacturer of the orifice bracket shall be such as to insure continued proper alignment of the orifice with the main burner venturi. The ceramic matrix shall employ the patented Schwank Effect Tile capable of sustaining 1650^{o}F. surface temperature while maintaining plenum temperatures below the flash point of the gas air mixture. Each tile shall have two hundred (1.28mm) expanded ports per square inch and a ceramic tile surface loading, based on an adjusted net radiant surface area, not to exceed 395 BTU per square inch at 1650^{o}F. radiant surface temperature. The adjusted net effective surface area of the ceramic emitter shall be 2.62 sq. in./1000 BTU of input $\pm$ 2-1/2%.

E. Each heater shall be equipped with a heat treated, polished aluminum shade. The standard equipment shade shall be suitable for easy field connection of an optional shade extension or an approved perforated protective screen as made available by the manufacturer.

F. All units are to be factory fire tested as a part of the standard production procedure. Firing and inspection to check for proper construction, including the absence of all gas leaks, control function, general operation of the unit and to assure that the unit operates at the published capacity.

G. Provide Solid State Ignition Detection Control System with 110V to 24V transformer and safety shut down (lock out).

H. Provide angle support between unit heater threaded rod supports and nearest wall to prevent unit sidesway.

I. Manufacturers: Perfection Schwank or approved equal.

2.13 FIRE DAMPERS

A. Provide and install all fire dampers in all ductwork which passes a fire wall or fire rated ceiling as required by local building and fire safety codes.

B. All dampers folding blade type with no part of blade in the air stream.

C. All fire dampers UL approved and of type required by NFPA 90A.

D. Install all fire dampers per manufacturer's instructions. Installation detail must be submitted with damper submittal. **Post detail at job site in area of building permit.**

E. Provide UL rated sleeves and manufacturer supplied wall angles with damper.

F. [Provide four additional fire dampers to be sized and installed as directed by Architect.]

G. Manufacturers: Ruskin, Air Balance, Arrow, Greenheck, Nailor or approved equal.

2.14 FIRE/SMOKE DAMPERS

A. Provide and install all fire/smoke dampers in all ductwork which passes through a smoke wall and/or any rated egress pathways, as required by local building and fire safety codes and as indicated on the drawings.

B. All dampers shall have qualified electric operators.

C. All dampers UL approved and of type required by NFPA 90A.

D. Install all dampers per manufacturer's instructions. Installation detail must be submitted with damper submittal. **Post detail at job site in area of building permit.**

E. All dampers shall have a UL555S leakage classification of II.

F. Provide UL rated sleeves and manufacturer supplied wall angles with damper.

G. Provide four additional fire/smoke dampers to be sized and installed as directed by Architect.

H. Manufacturers: Ruskin, Air Balance, Arrow, Nailor, Greenheck or approved equal.

2.15 CORRIDOR CEILING FIRE SMOKE DAMPER

A. Provide and install appropriate corridor ceiling fire smoke dampers in all air devices located in ceiling portion of fire rated floor/ceiling and/or roof ceiling assemblies.

B. Damper must be classified as a **Corridor Ceiling Fire Smoke Damper**.

C. All dampers must be UL approved and of the type required by NFPA 90A.

D. [Provide two (2) additional corridor ceiling fire smoke dampers to be located and sized as directed by the Architect.]

E. Install per manufacturer's recommendation, submit detail. **Post detail at job site in area of building permit.**

F. Manufacturers: Ruskin, Air Balance, Arrow, Nailor, Greenheck or approved equal.

2.16 CEILING FIRE DAMPER

A. Provide and install appropriate ceiling fire dampers in all air devices located in ceiling portion of fire rated floor/ceiling and/or roof ceiling assemblies.

B. Damper must be classified as a **Ceiling Fire Damper**.

C. All dampers must be UL approved and of the type required by NFPA 90A.

D. [Provide ten (10) additional fire dampers to be located and sized as directed by the Architect.]

E. Install per manufacturer's recommendation, submit detail. **Post detail at job site in area of building permit.**

F. Manufacturers: Ruskin, Air Balance, Arrow, Nailor, Greenheck or approved equal.

PART 3 - EXECUTION

3.01 LOW VELOCITY DUCTWORK

A. Provide ductwork in accordance with SMACNA low velocity standards.

B. Provide backdraft dampers for all exhaust fans if motor operated dampers are not called for. Provide one inch (1") mesh bird screen at all exhaust discharges.

C. Seal all transverse joints, seams and fitting connections with KINGCO 11-376 "Super Seal" or "Ductmate Proseal", U.L. listed.

D. Where ducts exposed to view, pass through walls, floors or ceilings, furnish and install sheetmetal collars to cover the voids around the duct.

E. This work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job against noise, chatter, whistling or vibration and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall either be removed and replaced or reinforced as directed by the Owner.

F. Duct shall be erected in the general locations shown on the drawings, but must conform to all structural and final conditions of the building. Before fabricating any ductwork, the Contractor shall check the physical conditions at the job site, and shall make all necessary changes in cross sections, transitions, offsets, etc., whether they are specifically indicated or not at no additional charge to the Owner.

G. Reinforce all ducts to prevent buckling, breathing, vibration or unnecessary noise, such reinforcing to be as recommended in the SMACNA manual plus any additional reinforcing as may be required to meet job conditions.

H. Provide manually operated volume control dampers (with stand-off mounting brackets for externally insulated ductwork) in all branches, splits and taps for proper balancing of air distribution, whether shown on drawings or not, dampers to be either single blade or multi blade as shown in the SMACNA manual as required. They shall incorporate an indication device with lock to hold damper in position for proper setting.

I. Damper operators in all unfinished areas shall be Young Series 400 of the exact style, type and size required. All other operators shall be Young #315 and/or #896 opposite end from the operator. Where dampers are installed in ducts located above accessible type ceilings, damper operators shall not be extended through the finished ceiling.

J. All square elbows shall have turning vanes per the SMACNA manual requirements.

K. Where ducts connect to fans, including roof exhausters, flexible connections shall be made using "Ventglas" fabric that is fire-resistant, waterproof, mildew-resistant and practically air tight, and shall weigh approximately thirty ounces per square yard. There shall be a

minimum of two and one-half inches (2-1/2") distance between the edges of the ducts. There shall be a minimum of one inch (1") of slack for each full inch of static pressure on the fan system.

L. Furnish and install screens on all ducts, fans, etc. furnished by the Contractor which lead to, or are outdoors. Screens shall be 16 gauge, three-eighths inch (3/8") mesh in removable galvanized steel frames.

M. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punches (not pin punches), and shall not be larger than necessary. All duct openings shall be provided with sheetmetal caps if the openings are to be left unconnected for any length of time. All panels of ducts twelve inches (12") and larger shall be cross broken.

N. Furnish and install a minimum 16 x 16 x 2 internally insulated (foil facing to airstream) filter rack with a hinged type access door with cam or spring lock and filter in all unfiltered raw outside air ducts that connect directly to return air plenums.

O. **All ductwork that is connected to any exterior louver or wall cap, etc. shall be sloped to drain outside.**

3.02 DUCTWORK SUPPORTS

A. Support all ductwork to prevent sag, undue play, and swing. All horizontal ducts shall have a support within 2' of each elbow and within 4' of each branch intersection. Provide a hanger within twelve inches (12") from unit supply and return. Return air plenums on back of air handling units must have a minimum of four (4) support straps.

B. Low Pressure Ductwork:

1. Duct 40" and Less: Provide with 1" x 18 gauge straps fastened to ductwork, and to building construction. Space not more than eight feet (8') on center. Hanger straps shall lap under duct a minimum of one inch (1") and have a minimum of one (1) fastening screw on the bottom and two (2) on the side.

2. Ducts Over 40": Provide mild steel threaded rods fastened to angle iron supports under duct with nuts and to building construction with appropriate inserts, flanges or clamps. Space not more than four feet (4') on center with rods and angle supports as follows:

Angle Length	**Angle**	**Rod Dia.**
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	2" x 2" x 1/8"	1/4"
8'-0"	2" x 2" x 1/8"	3/8"
10'-0"	3" x 3" x 1/8"	3/8"

C. Vertical ducts supported where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles.

D. Recommend methods of fastening bracing to ductwork, including riveting, bolting and tack welding.

E. All flex duct runouts must be properly supported. Use minimum twelve (12) gauge wire with

8” long saddle that fits up to mid point of duct for support of flex duct. **Web Type fabric duct support is strictly prohibited**. Maximum permissible sag is 1/2” per foot of spacing between supports.

F. Provide 1” x 20 gauge straps, minimum 8’ - 0” o.c. for all round sheetmetal runouts that are 18” in diameter or less (except Spiral Ducts).

G. Spiral ductwork is to be supported with 2” x 18 gauge strap bands around duct with a 3/8” bolt and nut connection at top. Connect to structure with minimum 3/8” all thread rods, minimum 8’-0” o.c.

3.03 ACCESS

A. Furnish all fans with consideration of location of motor and drive.

B. Furnish and install in the ductwork, hinged access doors to provide access to all manual and automatic dampers, fusible links, cleaning operations, etc. Where the ducts are insulated, the access doors shall be double skin doors with one inch (1”) of insulation in the door. In rectangular ducts larger than twenty inches (20”) in their smallest dimension, install access doors every twenty feet (20’). Where the size of the duct permits, the doors shall be eighteen inches (18”) by sixteen inches (16”). Factory fabricated doors as manufactured by Milcor meeting these specifications will be acceptable. Access doors shall be submitted for approval.

C. Each fire damper door shall have a label with letters not less than 1/2” in height reading **“Fire Damper”**, **“Corridor Ceiling Fire Smoke Damper”** or “**Fire/Smoke Damper”** (as applicable).

D. Cycle damper after installation to insure free movement. Seal opening around fire damper with non-combustible material to maintain integrity of one (1) hour fire wall.

E. Provide access door in supply air and return air drops from rooftop units. Access door to be in accessible location directly above first elbow. Access doors to be 18” X 18” minimum where duct size allows. Access doors shall be shown on ductwork shop drawings.

F. Provide access doors for maintenance inspection and cleaning in each zone duct for HETD. Locate downstream of first elbow in accessible location and indicate location on record drawings.

3.04 Fully coordinate and work directly with the Balancing and Testing Agency to provide all systems in perfect operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

3.05 For Each Dryer: Provide 4” diameter or 5” x 3” rectangular flue pipe up through the wall and ceiling cavity and terminate into Briedert Cap. Provide transitions as required. Provide 4” diameter tie in point for residential type dryer or stacked washer dryer as required.

3.06 **CAP OPEN ENDS OF ALL DUCTS (INCLUDING SPIN-INS) AND EQUIPMENT WITH MINIMUM FOUR (4) MIL. PLASTIC TO PREVENT CONSTRUCTION DEBRIS AND DUST FROM ENTERING OPENINGS AT ALL TIMES DURING CONSTRUCTION.**

END OF SECTION

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PROJECT NAME

SECTION 23 30 01 – SPECIAL DUCT SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description: This section describes specific requirements, products and methods of execution relating to the project air distribution systems.

B. Provide all air distribution systems as shown and specified, complete in every detail and in perfect operating order.

C. All equipment warranties to be per Specification Section 20 00 00, 1.17.

D. SPECIAL NOTE: All provisions and divisions of these specifications are a part of this section of these specifications. The Contractor shall consult these divisions and provisions in detail for instructions and include all items pertaining to this work. The Contractor shall consult all other divisions of these specifications, determine the extent of impact on the work required to complete the work required by this section of the specifications or portion thereof and related work shown on the drawings.

1.02 Provide all air distribution work in accordance with the minimum provisions of the latest approved editions of the following codes and standards.

A. NFPA 90 A - Air Conditioning and Ventilating Systems.

B. NFPA 90 B - Warm Air Heating and Air Conditioning.

C. SMACNA - Low Velocity Duct Construction Standards.

D. TIMA - Fibrous Glass Duct Construction Standards.

E. SMACNA - Duct Liner Application Standard.

F. SMACNA - Ducted Electric Heat Guide.

G. AMCA Standard 210-74 Laboratory Methods of Testing Fans for Rating Purposes.

H. AMCA Pub. 261 Directory or Products Licensed to Bear the AMCA Certified Rating Seal.

I. AMCA Standard 300-67 Test Code for Sound Rating.

J. AMCA Standard 301-65 Method of Publishing Sound Ratings for Air Moving Devices.

K. AMCA Publication 511-75 Certified Ratings Program for Louvers, Dampers and Shutters.

L. ASHRAE Standard 52-76 Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

M. ASHRAE Standard 70-72 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

1.03 Where any references to “sheetmetal work” or “ductwork” appears in this section of these specifications or on the drawings, it shall be construed to include outside air ducts, supply air ducts, return air ducts, exhaust ducts, relief ducts, plenums, duct taps, grille taps, diffuser connections and

all other related pieces and parts of the air conveying systems.

1.04 Before starting shop drawings or fabrication of any duct work, the Contractor must have an approved reflected ceiling plan with which he can coordinate location of air outlets, lights, grille patterns, etc.

PART 2 - PRODUCTS

A. Kitchen Exhaust System:

1. General: Provide kitchen exhaust system that complies with all local, state and federal codes. Slope horizontal duct 1" per foot toward hood.

2. Duct Construction:

a. All Type I kitchen exhaust duct is to be 18 gauge stainless steel; all seams and joints made with continuous grease tight weld. Stainless steel where exposed in kitchen with weld seams ground smooth and polished to be compatible with adjacent stainless steel kitchen equipment. Type I kitchen hood exhaust duct alternate: At Contractors option, concealed ductwork may be constructed of 16 gauge black steel with seams and joints same as above.

b. All Type II kitchen exhaust ducts, including dishwasher exhaust are to be constructed from minimum 18 gauge stainless steel sheets. All seams and joints to be made with continuous liquid tight weld. Grind smooth and polish welds on stainless steel ducts.

3. Access:

a. Provide grease rated access doors on side of duct as required for Type I grease rated exhaust duct systems.

b. Provide hinged curb for roof mount exhaust fan.

4. Exhaust Fan on roof to discharge at a minimum 40" above roof line.

5. Provide one (1) hour fire rated gypsum board enclosure around duct (Reference Architectural) (or insulate Type I Kitchen Exhaust with Type "F" insulation to achieve a 1 hour rated enclosure, when allowed by local code authority having jurisdiction). This includes any portion of hood extending above ceiling line.

B. [Ductwork Exposed to Weather:

1. All ductwork exposed to weather associated with all air handling units and exhaust fans shall be constructed of double-wall sheet metal ductwork with 2" of board insulation. Ductwork shall be sealed, taped, etc., for a complete leakproof system.

2. All field applied rigid board fiberglass duct insulation shall be equal to Owens-Corning Fiberglass 25 with ASJ all-service-jacket, having a density of approximately 4.2 pounds per cubic foot and a thermal conductivity of approximately 0.25 at 75^{O} F. The insulation shall be applied by use of weld pins or stick clips. Such fasteners shall be spaced three inches (3") from each corner of the board with intermediate pins spaced no more than twelve inches (12") on center.

3. For all ducts exposed to weather, after all duct joints are sealed as specified

hereinbefore, apply all over and around the same areas of possible leakage (joints), a pressureless tape with adhesive #HC-20. The tape and adhesive shall be manufactured by Hardcast, Inc. (Dallas, Texas) or equal. It is the intent of these specifications that ductwork outside the building shall be installed in a manner to result in 0% air leakage. Submit installation procedure and detail to Architect for approval prior to fabrication or installation.

4. Materials Used for Outdoor Insulation Jacket: Lockformable aluminum sheets with a minimum thickness of .032. Provide heavier gauges as recommended by industry standards or as required to prevent excess deflection. Joints shall be one inch standing seam type on top, lap seams on side, lap over in direction of water flow. Install jacket in such a manner that water will not pond or become trapped on any portion of the cover. The top of the jacket shall be pitched a minimum of one quarter inch per foot. Provide adequate supports under top to maintain slope and to prevent sagging. Top of jacketing shall not slope down toward a building penetration or a unit connection. In the event that it is impossible to slope away from a building or equipment connection, an integral seamless gutter shall be formed on end of top piece to prevent water from entering the building or the equipment to which the ductwork is connected.]

C. Science Hood Exhaust Ductwork:

1. Ductwork to be polyester corrosion resistant fiber equal to Peabody Spunstrand. All duct connections, supports and accessories shall be in accordance with manufacturer's recommendations.

2. Discharge cap to be 18 gauge stainless steel no loss rain stack. Stack to overlap exhaust duct 6" minimum, extend four (4) diameters above top of outlet and be one inch (1") larger in diameter than exhaust duct. (Reference Industrial Ventilation Fig. 6-24). Secure rain stack with guy wires to roof per roofing consultant detail. Submit shop drawing.

PART 3 - EXECUTION

3.01 LOW VELOCITY DUCTWORK

A. Provide ductwork in accordance with SMACNA low velocity standards.

B. Provide backdraft dampers for all exhaust fans if motor operated dampers are not called for. Provide one inch (1") mesh bird screen at all exhaust discharges.

C. Seal all transverse joints, seams and fitting connections with KINGCO 11-376 "Super Seal" or "Ductmate Proseal", U.L. listed.

D. Where ducts, exposed to view, pass through walls, floors or ceilings, furnish and install sheetmetal collars to cover the voids around the duct.

E. This work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job against noise, chatter, whistling or vibration and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall either be removed and replaced or reinforced as directed by the Owner.

F. Duct shall be erected in the general locations shown on the drawings, but must conform to all structural and final conditions of the building. Before fabricating any ductwork, the Contractor shall check the physical conditions at the job site, and shall make all necessary changes in cross sections, transitions, offsets, etc., whether they are specifically indicated or not at no additional charge to the Owner.

G. Reinforce all ducts to prevent buckling, breathing, vibration or unnecessary noise, such reinforcing to be as recommended in the SMACNA manual plus any additional reinforcing as may be required to meet job conditions.

H. Provide manually operated volume control dampers (with stand-off mounting brackets for externally insulated ductwork) in all branches, splits and taps for proper balancing of air distribution, whether shown on drawings or not, dampers to be either single blade or multi blade as shown in the SMACNA manual as required. They shall incorporate an indication device with lock to hold damper in position for proper setting.

I. Damper operators in all unfinished areas shall be Young Series 400 of the exact style, type and size required. All other operators shall be Young #315 and/or #896 opposite end from the operator. Where dampers are installed in ducts located above accessible type ceilings, damper operators shall not be extended through the finished ceiling.

J. All square elbows shall have turning vanes per the SMACNA manual requirements.

K. Where ducts connect to fans, including roof exhausters, flexible connections shall be made using “Ventglas” fabric that is fire-resistant, waterproof, mildew-resistant and practically air tight, and shall weigh approximately thirty ounces per square yard. There shall be a minimum of two and one-half inches (2-1/2”) distance between the edges of the ducts. There shall be a minimum of one inch (1”) of slack for each full inch of static pressure on the fan system.

L. Furnish and install screens on all ducts, fans, etc. furnished by the Contractor which lead to, or are outdoors. Screens shall be 16 gauge, three-eighths inch (3/8”) mesh in removable galvanized steel frames.

M. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punches (not pin punches), and shall not be larger than necessary. All duct openings shall be provided with sheetmetal caps if the openings are to be left unconnected for any length of time. All panels of ducts twelve inches (12”) and larger shall be cross broken.

N. Furnish and install a minimum 16 x 16 x 2 internally insulated (foil facing to airstream) filter rack with a hinged type access door with cam or spring lock and filter in all unfiltered raw outside air ducts that connect directly to return air plenums.

O. **All ductwork that is connected to any exterior louver or wall cap, etc. shall be sloped to drain outside.**

3.02 DUCTWORK SUPPORTS

A. Support all ductwork to prevent sag, undue play, and swing. All horizontal ducts shall have a support within 2’ of each elbow and within 4’ of each branch intersection. Provide a hanger within twelve inches (12”) from unit supply and return. Return air plenums on back of air handling units must have a minimum of four (4) support straps.

B. Low Pressure Ductwork:

1. Duct 40” and Less: Provide with 1” x 18 gauge straps fastened to ductwork, and to building construction. Space not more than eight feet (8’) on center. Hanger straps shall lap under duct a minimum of one inch (1”) and have a minimum of one (1) fastening screw on the bottom and two (2) on the side.

2. Ducts Over 40": Provide mild steel threaded rods fastened to angle iron supports under duct with nuts and to building construction with appropriate inserts, flanges or clamps. Space not more than four feet (4') on center with rods and angle supports as follows:

Angle Length	Angle	Rod Dia.
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	2" x 2" x 1/8"	1/4"
8'-0"	2" x 2" x 1/8"	3/8"
10'-0"	3" x 3" x 1/8"	3/8"

C. Vertical ducts supported where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles.

D. Recommend methods of fastening bracing to ductwork, including riveting, bolting and tack welding.

E. All flex duct runouts must be properly supported. Use minimum twelve (12) gauge wire with 8" long saddle that fits up to mid point of duct for support of flex duct. **Web Type fabric duct support is strictly prohibited**. Maximum permissible sag is 1/2" per foot of spacing between supports.

F. Provide 1" x 20 gauge straps, minimum 8' - 0" o.c. for all round sheetmetal runouts that are 18" in diameter or less (except Spiral Ducts).

G. Spiral ductwork is to be supported with 2" x 18 gauge strap bands around duct with a 3/8" bolt and nut connection at top. Connect to structure with minimum 3/8" all thread rods, minimum 8'-0" o.c.

3.03 ACCESS

A. Furnish all fans with consideration of location of motor and drive.

B. Furnish and install in the ductwork, hinged access doors to provide access to all manual and automatic dampers, fusible links, cleaning operations, etc. Where the ducts are insulated, the access doors shall be double skin doors with one inch (1") of insulation in the door. In rectangular ducts larger than twenty inches (20") in their smallest dimension, install access doors every twenty feet (20'). Where the size of the duct permits, the doors shall be eighteen inches (18") by sixteen inches (16"). Factory fabricated doors as manufactured by Milcor meeting these specifications will be acceptable. Access doors shall be submitted for approval.

C. Each fire damper door shall have a label with letters not less than 1/2" in height reading **"Fire Damper"**, **"Corridor Ceiling Fire Smoke Damper"** or "**Fire/Smoke Damper"** (as applicable).

D. Cycle damper after installation to insure free movement. Seal opening around fire damper with non-combustible material to maintain integrity of one (1) hour fire wall.

E. Provide access door in supply air and return air drops from rooftop units. Access door to be in accessible location directly above first elbow. Access doors to be 18" X 18" minimum where duct size allows. Access doors shall be shown on ductwork shop drawings.

F. Provide access doors for maintenance inspection and cleaning in each zone duct for RTUMZ. Locate downstream of first elbow in accessible location and indicate location on

record drawings.

3.04 Fully coordinate and work directly with the Balancing and Testing Agency to provide all systems in perfect operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

3.05 For Each Dryer: Provide 4” diameter or 5” x 3” rectangular flue pipe up through the wall and ceiling cavity and terminate into Briedert Cap. Provide transitions as required. Provide 4” diameter tie in point for residential type dryer or stacked washer dryer as required.

3.06 **CAP OPEN ENDS OF ALL DUCTS (INCLUDING SPIN-INS) AND EQUIPMENT WITH MINIMUM FOUR (4) MIL. PLASTIC TO PREVENT CONSTRUCTION DEBRIS AND DUST FROM ENTERING OPENINGS AT ALL TIMES DURING CONSTRUCTION.**

END OF SECTION

PROJECT NAME

SECTION 26 05 00 - GENERAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

Unless otherwise specified, provide all labor, equipment, supplies, materials, superintendence and testing necessary for the installation of complete electrical systems as required by these specifications and as shown on the Drawings, subject to the terms and conditions of the contract. Complete such details of electrical work not mentioned or shown which are necessary for the successful operation of all electrical systems described on the Drawings. Include empty conduits as required for all special systems and power for condensate pumps and HVAC control panels as required by the Mechanical Contractor. Field coordinate exact locations.

A. Submit a bid on the basis of a complete installation, including all labor, material, cartage, insurance, permits, associated fees and taxes.

B. Include temporary electrical power and lighting that will be required for the interior of the buildings. Provide lighting to satisfy OSHA requirements and the NEC.

C. All Agreement Forms, General Conditions, Supplementary Conditions, and Division 1 of the specifications shall apply to the work specified in Division 26-28.

D. Additional Site Visit Costs: The Contractor shall be charged with any cost resulting from uncompleted items that require additional site trips by the Architect/Engineer.

E. No attempt has been made to show complete design details of building construction on the Electrical plans. Refer to Architectural, Structural and Mechanical plans for additional details which will affect electrical work. No extra cost will be allowed for offsets in conduit and wiring to avoid other work or when minor changes are necessary to facilitate installation or maintenance.

F. Electrical Contractor is to provide all parts and labor to make final connections to all equipment shown in contract documents. Power may be shown in general location, it is expected that Electrical Contractor coordinate final locations for rough-in and connection requirements with exact equipment being installed. These items include but not limited to book security, exhaust fans, kilns, hand dryers, sensor operating plumbing devices, overhead doors, powered curtain, fire alarm door hold opens, etc.

G. NO TOXIC NOR HAZARDOUS MATERIALS, INCLUDING BUT NOT LIMITED TO PRODUCTS OR MATERIALS CONTAINING ASBESTOS, PCB AND LEAD SHALL BE PROVIDED OR INSTALLED.

H. REMODEL WORK: COORDINATE ALL CONNECTIONS OF NEW EQUIPMENT WITH EXISTING SERVICES. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT, MATERIALS AND INCIDENTAL ITEMS REQUIRED TO MAKE SYSTEM COMPLETE AND OPERABLE.

I. AN EXTRA COPY OF ALL FIELD REPORTS SHALL BE KEPT IN A SEPARATE NOTEBOOK. CONTRACTOR TO SET UP IN THE CONSTRUCTION MANAGER'S TRAILER. THESE REPORTS SHALL BE USED FOR CONTRACTOR TO CHECK THAT EACH INDIVIDUAL ITEM NOTED HAS BEEN COMPLETED. ALSO KEEP LOG OF WHERE EXTRA RECEPTACLES AND OUTLET BOXES CALLED OUT IN 26 27 26, 3.01 AND 26 05 80, 2.01. ARE INSTALLED.

J. Electrical Contractor shall use Fire Alarm Contractor's Shop Drawings and Rough-In details on drawings for rough-in of all fire alarm devices. Any devices not roughed-in according to Fire Alarm Shop Drawings and drawing details shall be relocated at no cost to Owner.

K. Sensor Operated Plumbing Devices: Plumbing Contractor to provide transformers from manufacturer. Electrical Contractor to provide all other electrical materials and labor to provide complete and workable device. This includes but is not limited to receptacles for plug in transformers, line voltage wire/conduit for direct connect low voltage transformers, all low voltage plenum rated 16 gauge wire.

L. **Cad Drawings:**
Architectural Background Files – Architectural Files are background files, MEP drawings are not background files. To insure the most current Architectural files are used for shop drawings backgrounds, they must be obtained from the architect and cannot be given from the engineer. Reference Architect for cost of Architectural Files.

MEP Drawings – These drawings cannot be used for shop drawings, as they are diagrammatic in nature only. Actual shop drawings prepared by sub-contractors must be used for coordination between all trades. If MEP floorplan files are requested, they may be obtained with a signed confidentiality release form, only as outlined below. These files may be used in conjunction with this project only. There are no guarantees of compatibility or accuracy; all technical support will be billed hourly at current Engineer's Rates. Engineer does not charge for actual file, but does charge for time required to prepare the files in format as requested by the Contractor. Fees will be based on Engineer's current hourly rates. Deposit of $500 must be paid prior to beginning file preparation and balance must be paid prior to release of any files. Total fee based on actual time required by Contractor's request. See submittal and shop drawing section for additional information.

MEP CAD Files that will be released.
- If no Architectural RCP is available for light locations, Lighting Floorplans will be released.
- Mechanical Floorplan will be released to Mechanical Contractor for aid in production of his own shop drawings. HCE mechanical drawings may not be submitted as shop drawings.
- Fire Alarm/Fire Sprinkler/Intercom etc… Contractors must use Architectural Revit Models and CAD files for backgrounds and Architectural RCP's (when available or lighting floorplan) and **Mechanical Contractor Shop Drawings** for coordination purposes. This must be obtained from Architect. Engineer may not release architectural drawings.

M. The Contractor binds himself, his partners, successors, assigns and legal representatives to the Owner hereto in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract, or sublet it as a whole, without the written consent of the Architect/Owner, nor shall the Contractor assign any monies due or to become due to him hereunder, without the previous written consent of the Owner/Architect.

N. The Contractor shall supervise and direct the Work using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, safety, sequences and procedures and for coordinating all portions of the Work under his Contract.

O. The Contractor shall provide, without extra charge, all incidental items required as a part of the Work, even though not particularly specified or indicated, and if he has good reason for objecting to the use of a material, appliance, or type of construction shown or specified, he shall register his objections with the Architect/Engineer, in writing; otherwise, he shall proceed with the work under the stipulation that a satisfactory job is required.

P. Provide a completed Schedule of Values, see Specification Section 26 05 10. Preliminary schedule of values shall be submitted to Architect/Engineer for review.

1.02 SITE INSPECTION

A. Prior to Bidding, the Contractor shall visit and examine the site verifying all existing items and familiarize himself with existing work conditions and understand the conditions which affect performance of the work of this Division before submitting bids for this work. The submission of bids shall be deemed as evidence of such visits and examinations.

B. All bids shall take the existing conditions into consideration and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility. No subsequent allowance for time or money will be allowed for work or change related to failure to examine site conditions.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. All work covered by this section of these specifications shall be accomplished in accordance with the respective drawings, information or instructions to bidders, and general provisions of these specifications. Any supplementary conditions, special conditions, addenda, or directives which may be issued by the Owner's representative, herewith or otherwise, shall be complied with in every respect.

B. Provide electrical connections and service to items described in all other sections of these specifications.

C. The Electrical Contractor shall provide all wiring and connections required to fire/smoke dampers. Coordinate exact locations of dampers with Mechanical Contractor and relay requirements with Fire Alarm Contractor.

D. The Electrical Contractor shall provide all wiring and connections required to backdraft dampers at exhaust fans. Coordinate exact locations of dampers with Mechanical Contractor.

E. Electrical Contractor to provide conduit and junction boxes for all sensors and exterior conduit for controls to mechanical equipment. Conduit for space sensor to extend from junction box to above accessible ceiling. Conduit for exterior equipment to extend from equipment through wall or roof to above an accessible ceiling. Any control wiring in exposed ceiling areas to be in conduit by Controls Contractor for protection. Controls Contractor to coordinate on all conduit requirements. Coordinate locations with Electrical Contractor.

1.04 WORK NOT INCLUDED

A. Certain labor, materials, or equipment may be provided under other sections of these specifications, by utility companies, or by the Owner. When such is the case, the extent, source and description of these items will be as indicated on the Drawings or described in the specifications, but the Contractor is responsible for verifying with all parties involved as to the extent of his requirements of work.

B. Unless otherwise indicated, motors shall be furnished by others, but connected by the Electrical Contractor as indicated on the Drawings.

C. Unless otherwise specified, Mechanical equipment control low voltage wiring (less than 50 VAC) shall be provided and installed by the Mechanical Contractor.

1.05 SPECIFICATION TERMINOLOGY (Definitions)

A. "Provide": Includes all material, installation, labor subcontracts, appurtenances and mark-up required for a complete operable system as shown and specified, set in place, connected and ready to use.

B. "Furnish": Purchase and deliver to job site, material as shown and specified.

C. "Install": Includes all installation, labor subcontracts, appurtenances and mark-up required for complete installation of equipment furnished by others.

D. "Record Drawings": Drawings that reflect the electrical systems as actually constructed by the Contractor including conduit routing.

E. "Accessible" means arranged so that an appropriately dressed maintenance man may approach the area in question with tools and products necessary for the work intended, and may then position himself to properly perform the task to be accomplished, without disassembly or damage to the surrounding installation. All clearances per NEC.

F. Wherever the term "shown on drawings" is used in the specifications, it shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.

G. "Conduit" includes, in addition to conduit, all fittings, hangers and other accessories relative to such conduit system.

H. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, imbedded in construction, crawl spaces, etc.

1.06 DIAGRAMMATIC DRAWINGS:

A. The drawings are in general diagrammatic, and the location of outlets, switches, motors, etc., on the drawings does not necessarily mean that such units shall be placed at that exact spot, as scaled on the drawings, but shall be located to function best. Use the drawings, and these specifications for guidance and secure the Engineer's approval of all changes in location. Coordinate all dimensions for floor boxes with Architect. Contractor shall not scale from drawings.

B. Verify all measurements at the site. No extra compensation will be allowed because of differences between locations shown on the drawings and measurements at the building.

C. The Contractor is to draw electrical rooms and service to scale **(1/4" minimum)** with actual equipment to be used and submit to the Engineer prior to installation. The Contractor must insure that all minimum NEC working clearances are maintained. Coordinate with equipment of other trades.

D. Where lighting fixtures and other electrical items are shown in conflict with structural members and mechanical or other equipment, provide all required supports and wiring to clear the encroachment.

E. The branch circuits and arrangement of home runs have been designed to compensate for voltage drop and other considerations to accomplish maximum economy. Re-circuiting will not be permitted without specific approval. **Circuit numbers may change to achieve balanced loads on panels.**

F. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

G. Drawings and specifications are complimentary each to the other. What is called for by one shall be as binding as if called for by both.

H. Should the drawings disagree in themselves, or with the specifications, the better quality or greater quantity of work or materials shall be used.

I. Outlets and switches obviously placed in a location not suitable to the finished room or area shall be removed and relocated when so directed by the Architect at no cost to the Owner. The Architect shall have the right to make any reasonable change in outlet locations before rough-in without additional cost to the Owner. The contractor shall contact engineer when switches are inadvertently shown on hinge side of door prior to rough-in.

J. Location of light fixtures shall be coordinated with reflected ceiling plans and/or room finish schedules.

1.07 MATERIAL AND EQUIPMENT SUBMITTALS

A. Submittals: Provide submittals for all products and systems described in Division 26-28 and shown on the drawings to demonstrate compliance with the requirements of the project. Furnish equipment submittals in the manner described elsewhere in these specifications.

B. Submit to the Engineer, after the award of the contract or as dictated by project schedule, a type written list of those items of equipment and appurtenances which will be furnished. Include the name or description of the item, name of manufacturer, model or type, catalog number and manufacturer's printed information. The information submitted shall include overall dimensions, weights, voltage rating, phase, wiring diagrams, etc., and nameplate data. Assemble cut sheets into separate submittals as defined in this section or by Specification Section. Submit priority items and long lead time first. Then follow with remaining items. This will allow for faster review and response to accommodate project schedule. **Any submittal with all sections under one (1) submittal number will be returned and required to be broken into unique separate submittal numbers.** The Engineer's check will be general and does not relieve the Contractor of final responsibility to comply with the Contract Documents in all respects.

C. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents. Submittals will not be checked for quantity, dimension, fit or proper technical design of manufactured equipment. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provision of a complete and satisfactory working installation is the sole responsibility of the Contractor. **Warranties cannot be reduced through the submittal process.**

D. Contractor shall indicate items being used on cut sheets by highlighting or arrowing to actual part number. Submittals may be returned without checking if submittals not appropriately marked.

E. **'Individual submittals' means separate submittals with unique submittal numbers for each specification section. Separate PDFs for each Submittal number.**

F. HARDCOPY SUBMITTAL REQUIREMENT: Hardcopy submittals will not be required by Engineer.

G. **PDF SUBMITTAL REQUIREMENT:**
For submittal sections listed below as allowed pdfs, the following requirements must be met or the submittal will not get through email security and will be auto-deleted and not checked. Each specifications section must be a separate pdf file, **one giant pdf for all sections will be rejected**.

PDF FILE: MUST BE NAMED AS FOLLOWS:
JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION

EMAIL TITLE/SUBJECT: FOR SUBMITTALS MUST BE AS FOLLOWS:
JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION

Failure to follow these instructions will result in the submittal never reaching the engineer and not being checked. Delays caused by not following these procedures are the sole responsibility of the contractor. Emailed submittals must come from the Architect and must not be emailed directly from the contractor. Do not Carbon Copy the Engineer on Emailed submittals.

H. **Multiple re-reviews required due to Contractor not following instructions, specifications, etc will be billed to Contractor at Engineer's current hourly rates. This shall be paid prior to submittal approval.**

I. **Submittals will be returned in order of construction of the project, not necessarily in order submitted.** If all sections are submitted under one binder/at one time and transmittal, each section will be returned at the appropriate time for construction phasing. Electrical Gear will not be reviewed until "Mechanical/Electrical Coordination Sheet" has been submitted. Electrical Gear and Light Fixtures may require extended review time**. If submittals are submitted early relative to construction phasing, submittals may be held, reviewed and returned at the appropriate time for construction phasing, not necessarily 2 weeks. In some cases, if submittals are received vastly out of order of construction, submittal may be rejected.**

J. **DO NOT SUBMIT THE FOLLOWING SECTIONS UNLESS DEVIATING FROM THE SCHEDULES/SPECIFICATIONS. Provide directly to General Contractor/CMR for inclusion into O & M Manuals. If deviating from the specifications, submittal will be required. (Highlight items in each submittal content that are different to allow for proper review.):**

1. 26 05 00 – General Provisions
2. 26 05 10 – Schedule of Values
3. 26 05 19 – Wire and Cable
4. 26 05 26 – Grounding and Bonding
5. 26 05 29 – Hangers and Supporting Devices
6. 26 05 33 – Raceways
7. 26 05 34 – Outlet Boxes, Pull Boxes and Junction Boxes
8. 26 05 80 – Empty Raceway Rough-In
9. 26 27 26 – Devices
10. 26 28 10 – Manual Motor Starters

11. 26 28 15 – Safety Disconnect Switch
12. 26 28 16 – Fuses
13. 26 28 20 – Combination Motor Starters
14. 26 28 25 – Contactors

K. **PDF Submittals Allowed** for Product Cut-Sheets are limited to the following items: **Separate PDF file for each Submittal number is required. Follow file format above.**

1. 26 09 00 – Stage Lighting Control and Dimming Systems
2. 26 22 13 – (K7 – DOE 2016) Transformer Dry Type
3. 26 24 13 – Main Switchboard
4. 26 24 16 – Branch Circuit Panelboards
5. 26 32 13 – Emergency Power System (Generator)
6. 26 43 00 – Surge Protective Devices
7. 26 51 00 – Interior Lighting System
8. 26 56 00 – Exterior Lighting System
9. 26 56 10 – Sports Lighting System
10. 26 56 11 – Sports Lighting System (Musco)
11. 27 51 00 – Intercom and Clock System - (Product Data and Shop Drawings)
12. 27 51 16 – Standard) Sound Reinforcement System
13. 27 51 17 – (Hi-End) Sound Reinforcement System
14. 27 51 18 – Sound Reinforcement System – Football Field
15. 28 16 00 – School Security System
16. 28 31 00 – Fire Alarm System - (Product Data and Shop Drawings)
17. 28 31 10 – Fire Alarm System – Fire Station
18. 28 31 33 – Elevator Recall System
19. Electric Rooms (coordinate with mechanical). Also, include other equipment and/or systems on plan.

L. When requested, present samples of all materials proposed for use to the Engineer for his approval.

M. Certify Shop Drawings have been checked for compliance with Contract Documents. Certify that the materials submitted can be delivered and installed according to the construction schedule.

N. Select all other materials, not specifically described on the Drawings or in these specifications but required for a complete and operable facility, and submit to the Engineer for approval.

O. **Substitutions:** ("Substitution Request" form must be submitted)

1. Substitutions must be made and accepted PRIOR to Bid.

2. Unless otherwise indicated, base bid on the equipment shown on the Drawings and hereinafter specified.

3. Request for approval to substitute materials, methods, or processes shall be made to Architect and if found acceptable, will be confirmed by an addendum to the Construction Documents. Where proposed substitutions are not incorporated into the Construction Documents by addendum **PRIOR** to time of the General Contract bid opening, all bids shall be held to have been made on the basis of the materials, methods and processes required by the Construction Documents.

4. All substitutions shall be of equal or better quality to the equipment specified.

5. Acceptance of the substitution by the Engineer does not relieve the Contractor of responsibility for proper operation of the systems, compliance with specifications, necessary changes due to dimensional differences or space requirements, and completion of work on schedule.

6. It is not the intent of the Specifications to limit materials to the product of any particular manufacturer. Where definite materials, equipment and/or fixtures have been specified by name, manufacturer or catalog number, it has been done so as to set a definite standard and a reference for comparison as to quality, application, physical conformity and other characteristics unless no substitutions are noted.

7. **Submit fully completed "Substitution Request" form located at end of this section. If this form is not submitted, all substitution request will be automatically rejected.**

8. **For substitutions that require substantial review by engineer to ensure equality, the contractor requesting substitutions shall reimburse the engineer at current hourly rates for all review time. This shall be paid prior to submittal approval. This applies to all equipment not previously approved on construction documents.**

   a. Light Fixtures Packages

   b. Alternate Transformers

   c. Alternate Surge Protective Devices

   d. Alternate Equipment/Gear Packages

   e. Contractor Cost Savings Packages Requiring Substantial Review Time

1.08 SHOP DRAWINGS REQUIRED

A. Prepare and submit working construction drawings as requested, specified, and otherwise necessary to demonstrate proper planning for installation and arrangement of all work. Layout drawings to scale and show dimensions where accuracy of location is necessary for coordination or communication purposes. Show work of all trades, including Architectural, Structural, Mechanical, and Electrical items which may be pertinent to proper and accurate coordination.

B. Architectural drawings must be used for backgrounds in preparation of shop drawings and

shall be obtained from the Architect. Confirm requirements and stipulations for obtaining floor plan backgrounds with Architect and with other sections of specification. Engineer's drawings and CAD files **may not** be used for Shop Drawings. Reference 1.01-L.

C. Reference other specification for additional requirements.

1. Fire Alarm

2. PA System

3. Electrical Rooms

1.09 RECORD DRAWINGS

A. Reference requirements stated elsewhere in the specifications.

B. THE CONTRACTOR SHALL TAPE ALL ADDENDAS ISSUED DURING BIDDING TO HIS CONSTRUCTION AND RECORD DRAWING SET PRIOR TO COMMENCING CONSTRUCTION. PAY REQUESTS WILL NOT BE PROCESSED UNTIL THIS REQUIREMENT IS MET.

C. In addition to other requirements, a master Record Drawing print set (separate from field sets) shall be kept in the site construction office as the work progresses. Show routing and location of items cast in concrete or buried underground. Work located in spaces with access, or above suspended ceilings, is not considered permanently concealed. Show complete routing and sizing of any significant revisions to the systems shown. Indicate locations of all existing active and inactive conduit uncovered during construction**. Keep marked up set at site for review at site meetings**.

D. **Contractor to indicate conduit routing locations for all major runs and branch circuits under slab along with major junction locations.**

E. The Contractor shall be responsible for updating all items, including but not limited to floor plan changes, system changes, addendums, change orders, etc. on the prints to "As-Built" conditions. At the completion of the job the marked up As-Built Drawings shall be submitted to the Architect for final review and comment. These corrected prints together with all the revisions, additions and deletions of work, shall form the basis for preparing a set of record drawings.

F. Using the "Record Drawing Set", the Contractor shall print two (2) complete sets of prints one for submission to the Owner and one rolled in a 4" PVC pipe in main electric room mounted to wall and labeled. Tape all edges. The contactor shall provide pdf copies/scans for owner record purposes. Remove Engineer's seal from record drawings.

G. The Contractor shall bear all the costs of producing the "Record Drawing Set".

H. Electrical riser diagrams shall be laminated and mounted in the main electrical room or as directed by the Engineer.

1.10 CODES, REGULATIONS AND ORDINANCES

A. Comply with the requirements of the National Electrical Code, National Electrical Safety Code, Occupational Safety and Health Act (OSHA) and all other applicable Federal, State

and local codes and ordinances. All codes and standards shall be per the latest adopted edition with all supplements and official interpretations included. Provide disconnecting means for all equipment per NEC. The Drawings and specifications take precedence when they are more stringent than codes, standards, ordinances, and statutes take precedence when they are more stringent or conflict with the Drawings and specifications.

B. Should the Contractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances and Industry Standards, he shall bear all costs arising in correcting the deficiencies, as approved by the Architect.

C. All work shall also satisfy applicable local codes, ordinances, and regulations of the governing bodies, and all authorities having jurisdiction over the work. Where alterations to, or deviations from, the drawings and specifications are required by the authority having jurisdiction, report the same in writing to the Owner's representative and secure his approval before proceeding.

1.11 DELIVERY AND STORAGE OF EQUIPMENT AND MATERIAL

A. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the building.

B. Retain all portable and detachable parts or portions of installation such as fuses, key locks, adapters, blocking clips, and inserts until final completion of work. Deliver parts to the Owner or his authorized representative and attach an itemized receipt to obtain request for final payment.

C. Product Handling:

1. Use all means necessary to protect the work and materials of this section before, during, and after installation and to protect the work and materials of all other trades.

2. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

3. Store and protect materials and equipment in accordance with the manufacturer's recommendations.

4. Provide suitable box or crate electrical equipment and cover with waterproof covers to protect against dirt, moisture or accidental damage during shipment or outdoors at the job site.

5. Store all conduits on skids.

1.12 SERVICEABILITY OF PRODUCTS

A. Furnish all products to provide the proper orientation of serviceable components to access space provided.

B. Coordinate installation of piping, ductwork, equipment, conduits, junction boxes, panels and other products to allow proper service of all items requiring periodic maintenance or replacement.

C. Replace or relocate all products incorrectly ordered or installed to provide proper serviceability.

PROJECT NAME

1.13 ACCESSIBILITY OF PRODUCTS

A. Arrange all work to provide permanent, convenient and safe access to all serviceable and/or operable products. Layout work to optimize net usable access space within confines of space available. Advise Architect, in a timely manner, of areas where proper access cannot be maintained. Furnish layout drawings to verify this claim, if requested.

B. Provide access doors in ceilings, walls, floors, etc. for access to automatic devices and all serviceable or operable equipment in concealed spaces. Location of panels shall be submitted for approval in sufficient time to be installed in the normal course of work.

1.14 UTILITY COSTS

A. Provide complete utility service connections. The locations and elevations of the various utilities included within the scope of this work have been obtained from city and/or other substantially reliable sources as a general guide only, without guarantee as to accuracy. Verify the locations, elevations, and availability of all utilities and services required, and be adequately informed as to their relation to the work.

B. Include all service charges required by the electric utility or telephone/data/cable utility. Reference General Conditions for further information. Keep all utility company charges as a separate line item in bid. If cost is not available from utility company, indicate utility contact person, telephone number and **date of contact**.

1.15 CLEAN-UP

A. Remove debris and waste materials from within the construction areas and transport off-site, daily.

B. Keep the construction area clean, free from hazard, and orderly arranged.

C. Pay all costs of waste removal and disposal. Reference General Conditions for further information.

D. Dispose of waste materials in accordance with all regulations which govern.

E. Take all precautions to protect persons who enter the construction area from hazardous conditions, hazardous waste, toxic waste, or other unsafe conditions.

F. Upon completion of construction, remove all debris, waste materials, unused materials, temporary constructions, vehicles, tools, fencing, etc. to Owner’s satisfaction.

G. All equipment and materials shall be protected from physical moisture absorption, metallic corrosion and weather damage from time of delivery to completion of project. Replace any damaged materials.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Unless otherwise indicated, provide only new equipment and materials.

B. On all major equipment components, provide manufacturer’s name, address, model number, and serial number permanently attached in a conspicuous location.

C. All materials furnished under these specifications shall be the standard product of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest approved standard design.

D. Guarantees:

1. The Contractor and Manufacturers shall provide a ONE (1) YEAR guarantee for all work under the Electrical Trade. However, such guarantees shall be in addition to and not in lieu of all other liabilities which the manufacturer and the Contractor may have by law or by other provisions of the Contract Documents. In any case, such guarantees and warranties shall commence when the Owner accepts the mechanical/electrical system, as determined by the Architect and shall remain in effect for a period of ONE (1) YEAR thereafter.

2. All materials, items of equipment, all lighting, and workmanship furnished under each section shall carry a ONE (1) YEAR warranty against all defects in material and workmanship. Any fault under any contract, due to defective or improper material, equipment, workmanship or design which may develop, shall be made good, forthwith, by and at the expense of the Contractor for the work under his Contract, including all other damage done to areas, materials and other systems resulting from this failure.

3. The Contractor shall guarantee that all elements of the system, which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.

4. Upon receipt of notice from the Owner of failure of any part of any systems or equipment during the guarantee period, the affected part or parts shall be replaced by the Contractor for his respective work, as applicable.

5. Furnish, before the final payment is made, a written guarantee covering the above requirements.

6. Reference other guarantee information elsewhere in these specifications.

E. All materials exposed within a plenum shall be noncombustible or shall have a flame spread index of not more than 25, and a smoke developed index of not more than 50, when tested in accordance with ASTM E 84.

2.02 STANDARDS

A. Where the Underwriters' Laboratories (UL) have established standards and issued labels for a particular group, class or type of material, apparatus, appliance or device, provide the UL label on all such items in that category incorporated into the work.

B. Where such items are not covered by UL standards, they shall meet or exceed the requirements of the current National Electrical Code (NEC), or if not covered there, by the applicable, published, recognized standard of the American National Standards Institute (ANSI), or of the industry and of the related engineering society. Example: National Electrical Manufacturers Association (NEMA) and Institute of Electrical and Electronics Engineers (IEEE).

C. Contractor is to follow the most current version adopted for all codes and standards.

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING

A. Carefully lay out all work in advance so as to minimize cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, etc. Perform all cutting, channeling, drilling, etc., as required for the proper support, concealment, installation, or anchorage of raceways, outlets, or electrical equipment in a careful manner. Any damage to the building, structure, piping, ducts, equipment, or defaced finish, tile, plaster, woodwork, or metal work shall be repaired by skilled mechanics of the trades involved at the Contractor's expense and to the satisfaction of the Engineer. All cutting, channeling, chasing, or drilling of unfinished masonry, tile, etc., or cutting, drilling, anchoring to or welding of structural members shall be performed in a manner having the Engineer's prior approval. All openings made in fire rated or smoke rated walls, floors, and ceilings shall be patched and made tight in a manner to conform to the fire rating or smoke rating for the enclosure.

B. Where conduits pass through exterior walls, thoroughly caulk with sealant the annular space around the conduit to provide a watertight closure at the interior wall cavity and exterior wall surface. Provide ¼" maximum annular space around the conduit. Provide and install all counterflashing of all conduit, pipe and supports which pierces roofs and other weather barrier surfaces. Verify detail with Architect before installation. All work shall be performed in a workmanlike manner to assure weatherproof installation. Any leaks developed shall be repaired at his expense, to Architect's satisfaction. All waterproofing, flashing and counterflashing shall be compatible with roofing system so as not to void any roof warranties. Confirm installation with Architect and Roofing Contractor.

3.02 SEALING AND FIREPROOFING

A. **SEALING OF PENETRATIONS THROUGH RATED WALLS, FLOORS, CEILING AND ROOF ASSEMBLIES SHALL BE INSTALLED PER UL "FIRE RESISTANCE DIRECTORY." UL SYSTEM NUMBERS INDICATED ARE FOR A PARTICULAR LISTED INSTALLATION AND ARE FOR GENERAL INFORMATION AND INTENT. OTHER LISTED UL SYSTEM DESIGNS MAY BE USED. IN ALL CASES, SUBMIT MATERIALS, UL SYSTEM DESIGN NUMBERS AND UL DETAILS TO BE USED THROUGHOUT THE PROJECT AND IDENTIFY WHICH DETAIL IS TO BE USED FOR EACH SPECIFIC CONDITION. POST REVIEWED DETAIL AT JOB SITE FOR REFERENCE.**

1. Only materials tested in the specific UL System No. may be used.

a. Caulk Manufacturer:

1) 3M Type CP-25 W/B + for all assemblies requiring 3M caulk.

2) For WL3045 and WL3046 use Hilti FS611A sealant.

b. Steel Sleeve (stud wall) (UL System No. WL1003): Cylindrical sleeve shall be fabricated from minimum 0.019" thick (no. 28 gauge) galvanized sheet steel and having a minimum two inch (2") lap along the longitudinal seam. Length of steel sleeve to be equal to thickness of wall plus one inch (1") such that, when installed, the ends of the sleeve will project approximately 1/2" beyond the surface of the wall on both sides of the wall assembly. The diameter of the openings cut on each side of the wall assembly (concentric with conduit) to be 2 to 2-1/2" larger than the outside diameter of conduit such that, when the steel sleeve is installed, a 1 to 1-1/4" annular space will be present between the steel sleeve and the conduit around the entire

circumference of the conduit. Install sleeve by coiling the sheet steel to a diameter smaller than the through opening, inserting the coil through the openings and releasing the coil to let it uncoil against the circular cutouts in the gypsum wallboard layers.

c. Optional Steel Sleeve (concrete or block wall): Except for single insulated cables, provide sleeve cast in floor/wall or mortared into CMU wall; Schedule 40 or heavier, length to extend a maximum one inch (1") from top surface of floor or a maximum of one inch (1") from both sides of wall.

d. Forming Material: Minimum one inch (1") thickness mineral-wool batt insulation material. Tightly pack into sleeve with minimum 1/2" recess on ends. Manufacturer: Thermafiber Safing Insulation.

2. Firestop system shall be installed at top surface of floor and symmetrically on both sides of wall assemblies and one (1) side of floor.

3. Alternate floor penetration system (with firestop mortar): UL System No. CAJ1032.

4. Wires and Cables:

a. For gypsum frame wall, single cable: Fireproof per UL System No. WL3001. Opening for cables to be hole-sawed through gypsum wall board layers. Diameter of opening to be 3/8" to 5/8" larger than outside diameter of cable. Cable to be rigidly supported on both sides of wall assembly. Caulk to fill annular space throughout thickness of gypsum wall board layers and apply 1/4" bead of caulk to perimeter of cable at its egress from wall (both sides).

b. For gypsum frame wall, multiple cables: Use UL system No. WL3021, WL3045, WL3046 or equivalent to maintain rating of wall.

c. For concrete walls/floors or CMU walls, single or multiple cables: Fireproof per UL System No. CAJ3030. Install sleeve in assembly flush with both sides. Cables to be a minimum of ten percent (10%) and a maximum of thirty-three percent (33%) of cross-sectional area of opening. Recess minimum one inch (1") thickness of mineral wool material into opening around cables. Caulk openings around cable to minimum depth of one inch (1"). Optional sleeve may be used per UL detail requirements.

5. Reference Architectural for the exact location of all rated walls, floors, ceilings and ceiling/roof assemblies.

6. Materials used in firestop systems shall be installed in accordance with the manufacturer's written instructions (shall be posted at job site, in General Contractors trailer), provided with materials for specific UL System No.

7. Manufacturers: 3M, Metacaulk, Hilti, BioFireshield or equal.

B. In non-rated walls identified for sound insulation, provide 1/2" space between conduit and sleeve packed with multiple layers of forming material. Allow 5/8" minimum space on each side and caulk with acoustical sealant.

C. **Final condition to prevent passage of fire, smoke, noxious gas and water.**

D. For non-rated electrical/mechanical rooms: Seal all conduit passing through room walls,

floors and ceilings with 3M caulk, Type CP-25 WB+.

3.03 WORKMANSHIP AND COMPLETION OF INSTALLATION

A. For the actual fabrication, installation and testing, use only thoroughly trained and experienced workmen completely familiar with the items required and with the manufacturer's recommended methods of installation. In acceptance or rejection of the installed work, no allowance will be made for lack of skill on the part of workmen.

B. Install all specialties as detailed on plans. Where details or specific installation specifications are not included herein, follow approved manufacturer's recommendations.

C. Install complete, thoroughly check, correctly adjust, clean, and leave ready for operation all equipment and material connected with this project.

D. Ballasts, contactors, starters, transformers and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

E. Electrical service stub locations, sizes and quantities for equipment are approximate only. The Contractor must verify all service locations, sizes and quantities with the equipment supplier before rough-in.

F. The Electrical Contractor shall make all final connections to all electrical equipment furnished and set in place by others, including millwork with outlets. The Electrical Contractor shall provide and install all disconnect switches as required.

G. The Electrical Contractor shall provide/install all circuit breakers, power wiring, conduit systems and final connections required for operation of heating cable systems.

H. Provide and install all adjustable mounting brackets, steel bar hangers, T-bar mounting clips, support channels and universal support bridges as required for installation of recessed light fixtures, speakers, alarm devices and other ceiling mounted devices. Ceiling tile shall not be used to support ceiling mounted devices in lay-in ceilings.

I. Provide wood trim for any semi-recessed panels installed. Verify finishes with the Owner/Architect.

J. Provide Hoffman enclosure (#A-244208WFLP) wall mounted at location shown on plans. Provided in enclosure shall be spare fuses, three (3) of each amperage used in project up to 100 amp size and spare smoke detectors (see Section 28 31 00.)

K. Equipment and materials shall be listed by an organization that evaluates products and states that the equipment or material, either meets appropriate designated standards or has been tested and found suitable for a specified purpose or shall be labeled by the manufacturer to indicate compliance with appropriate standards or performance in the specified manner to be used.

1. Listed or labeled equipment and materials shall be applied, installed, connected, erected, used, cleaned, adjusted, and conditioned in accordance with any instructions included in the listing or labeling.

L. The installation shall be performed by licensed, competent workmen to provide a thorough and complete installation.

M. All work shall be accomplished in conjunction with other trades in a manner which will allow each trade adequate time at the proper stage of construction to fulfill his work.

N. Exact locations shall be determined by reference to the general plans and measurements at the building and shall be subject to reasonable change by the Owner's representative without additional cost.

O. Prior to and during construction, provide adequate storage facilities and properly protect items subject to any damage. Failure to comply with this provision will be sufficient cause for the rejection of the particular apparatus involved.

P. At completion, the installation shall be thoroughly cleaned. All tools, equipment, obstructions, temporary power, temporary lighting and debris shall be removed from the premises.

3.04 BALANCING SYSTEM

A. Balance the electrical system between the respective phases of the system. Balance individual circuits in each panel of the system. Where phase assignments or circuit numbers are indicated on the drawing, do not deviate without the Engineer's approval. All deviations shall be noted on panelboard submittals and on Record Drawings and schedules

B. **Reference Cx Commissioning specification for additional information and requirements.**

3.05 COOPERATION WITH OTHER CONTRACTORS

A. Cooperate with other Contractors so that the installation of the electrical materials and equipment may be properly coordinated. Where a conflict occurs with piping, duct work, etc., it shall be resolved as directed by the Engineer.

B. Interferences between conduit and other trades shall be handled by giving precedence to pipe lines requiring grade for proper operation. Where space requirements conflict, the following order of precedence shall generally be observed:

1. Building Lines
2. Structural Members
3. Drainage Waste and Vent Piping
4. Refrigerant Piping
5. Ductwork
6. Water and Gas Piping
7. Electrical Conduit
8. Fire Protection Piping

3.06 COORDINATION OF WORK

A. Each Contractor shall compare his drawings and specifications with those of other Trades and report any discrepancies between them to the Architect and obtain from the Architect written instructions to make the necessary changes in any of the affected work. All work shall be installed in cooperation with other Trades installing inter-related work. Before installation,

all Trades shall make proper provisions to avoid interferences in a manner approved by the Architect.

B. Locations of conduit and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Exact routing and location of systems shall be determined prior to fabrication or installation.

C. Offsets and changes of direction in all conduit systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings.

D. Where discrepancies in scope of work as to which Trade provides items such as starters, disconnects, flow switches and the like exist, such conflicts shall be reported to the Architect prior to signing of the Contract. If such action is not taken, the various Trades shall furnish such items as part of their work for complete and operable systems.

E. Verify voltage, phases, termination points, termination requirements and required disconnects for all equipment provided as part of this contract or equipment furnished by Owner prior to rough-in. Report any discrepancies to Architect/Engineer.

F. The Contractors are to avoid routing conduit through fire rated assemblies where practical. Each trade is responsible for proper coordination of required sleeves or block-outs with rated assembly installers. Each trade is responsible for providing sleeves, as required, for his work. Each trade shall verify acceptable tolerances around penetrating item in fire assembly before beginning fire sealing.

G. The Electrical Subcontractor shall verify with HVAC, Plumbing and Fire Protection Subcontractors the required electrical characteristics for all motors and equipment before ordering and submitting of electrical gear. Verify actual connection points prior to installation and roughing-in. Mechanical and Electrical Contractor are responsible for coordination of electrical requirements and final fuse sizes of all A/C equipment. When Mechanical Contractor substitutes equipment that requires additions or upgrades to electrical system, he shall bear all costs arising from such substitutions. Reference "Mechanical/Electrical Coordination Sheet" in specifications.

3.07 SAFETY PRECAUTIONS AND PROGRAMS

A. It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar and comply with all requirements of Public Law 91-696, 29 U.S.C. Secs. 651 et. seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto, and to enforce and comply with all of the provisions of this Act. IN ADDITION, ON PROJECTS IN WHICH TRENCH EXCAVATION WILL EXCEED A DEPTH OF FIVE FEET, THE CONTRACTOR AND ALL OF ITS SUBCONTRACTORS SHALL COMPLY WITH ALL REQUIREMENTS OF 29 C.F.R. SECS. 1926.652 AND 1926.653, OSHA SAFETY AND HEALTH STANDARDS.

3.08 OPERATING AND MAINTENANCE MANUALS

A. Provide one (1) Operation and Maintenance manual for training of Owner's personnel in operation and maintenance of systems and related equipment in the manner described elsewhere in these specifications. In addition, organize manuals and include data and narrative as noted below (bind each manual in a hard-backed loose-leaf binder. Use 8-1/2" x 11" white paper). Provide PDF copy of O&M for owner records

B. Operating Sequence and Procedures:

1. Contents: In each chapter, describe the procedures necessary for personnel to

operate the system and equipment covered in that chapter.

2. Typewritten Operating Procedures: Write procedures for start-up, operation and shutdown.

   a. Start-up: Give complete step-by-step instructions for energizing equipment, making initial setting and adjustments whenever applicable.

3. Shutdown Procedures: Include instructions for stopping and securing the equipment after operation. If a particular sequence is required, give step-by-step instructions in that order.

C. Maintenance Instructions:

1. Provide a schedule of preventive maintenance for each product. Recommend frequency of performance for each preventive maintenance task: i.e., cleaning, inspection, etc.

D. Manufacturer's Brochures: Include manufacturers' descriptive literature covering all appurtenances used in each system, together with illustrations, exploded views and renewal parts lists. Provide the nearest manufacturer's representatives name, address and phone number.

E. Shop Drawings: Provide two copies of all corrected, approved submittals and shop drawings covering equipment for the project either with the manufacturer's brochures or properly identified in a separate subsection.

F. Spare Parts Lists: Include a list of all equipment furnished for the project, with a tabulation of descriptive data of all the spare parts proposed for each type of equipment or systems. Properly identify each part by part number and manufacturer.

3.09 IDENTIFICATION

A. Equip the following items with nameplates:

1. Motor Starters

2. Main Switchboard and Overcurrent Devices and Spares

3. Panelboards and Branch Circuits

4. Safety Disconnect Switches

5. Contactors

6. Control/Power Equipment in Separate Enclosures Including Relays

7. Bypass Switches and Transfer Switches

8. Emergency Generator Sets

9. UPS System and Battery Racks

10. Motor Control Centers

11. Transformers

B. No dymo (stick on indented plastic) type label will be permitted.

C. Identify equipment listed above. COORDINATE EQUIPMENT NUMBERS WITH MECHANICAL AND/OR KITCHEN PLANS. Each piece of equipment shall be numbered consistently throughout.

D. Fabricate nameplates as follows:

1. Provide three (3) ply, 1/16” laminated plastic nameplate material with white core for lettering and black background. All nameplates, for equipment powered from emergency circuits, shall have white core for lettering and red background.

2. Use capital letters.

3. Unless otherwise indicated, provide minimum 3/4” high x 2” long nameplates with 1/4” letters.

4. All labels shall be permanently affixed to the front of all required equipment using two (2) round head self tapping screws. Self-adhesive labels are not acceptable. Align labels with equipment.

E. All junction boxes shall have the panel/circuit number(s) identified on the blank coverplate, handwritten with a permanent black marker. Disconnects, combination motor starter/disconnects and manual motor starter shall have the panel/circuit number(s) identified on the inside of the front cover, hand written with a permanent black marker.

F. Provide engraved coverplates for all switches and control devices which are not otherwise clearly related to the equipment they serve.

G. Label all receptacles and light switches with circuit number using electronic labeler (black on clear). Install label level on front of face plate for receptacles and back side of face plate for light switches.

H. Spray paint J-Boxes red for Fire Alarm System. All other special systems J-Boxes to be painted white.

I. Color code all 600 volt insulated conductors by installing conductors with factory colored insulation for conductors No. 10 AWG and smaller.

J. Install colored tape on all 600 volt conductors No. 8 AWG and larger. Apply tape 6 inches from terminal points. Do not cover factory applied cable identification markings with taping; tape locations may be adjusted slightly to prevent the covering of factory markings. Tape shall be Scotch No. 35 or approved equal, 7-mil thick by 3/4” wide vinyl adhesive tape.

K. Install engraved plastic laminate nameplates as listed below.

EQUIPMENT	LETTERING SIZE	INFORMATION
Switchboards, Panelboards, MCCs and other distribution system overcurrent devices	1/4" / 1/8"	Switchboard name designation, ampere rating of the supply conductors, voltage characteristics, power source and room number(s). EX: MDP, 1900A, 480Y/277V, Served from Utility EX: HVA, 175A, 480Y/277V, source DP-1,3,5. in Room 100.
Transformers	1/4" / 1/8"	Transformer name designation, load served, power source and room number(s). EX: Trans. TR-1, serves PANEL LV-1, source DP-7,9.11 in Room 203.
Remotely mounted Safety Switches and Starters	1/8"	Load served, power source and room number(s). EX: HWP-1, HVA 37,39,4 1 in Room 203. EX: PANEL LV-2 in Room 303, source TR-2.
Contactors	1/8"	Load served, power source and room nember(s). EX: Room 502, Science Lab, LVA 31,33 35, 37,39,4 1. EX: Building security lights, HVA 2, 4. EX: Parking lot lights, HVA 6, 8, 10.

L. Prepare a neatly typed panelboard circuit directory. Identify all circuits by the equipment served and by the room number, room numbers may be different from those shown on drawings. Verify room numbers prior to typing directories. Indicate spares and spaces with light, erasable pencil marking.

3.10 TESTING

A. Test and record results for all power feeders for Megger Readings, including phase to phase and phase to ground as recommended by the cable manufacturer.

B. Measure and record service ground resistance.

C. For equipment having ground-fault protection, the ground-fault protection system shall be performance tested when first installed on site. The test shall be conducted in accordance with instructions which shall be provided with the equipment. A written record of this test shall be made and shall be submitted to the Engineer and a copy put in the Operation and Maintenance Manuals.

3.11 CERTIFICATE OF COMPLETION

A. Submit, at time of request for final inspection, a completed letter in the following format:

I, (Name) , of (Firm) , certify that the electrical work is complete in accordance with Contract Plans and Specifications, and authorized change orders (copies attached) and will be ready for final inspection as of (Date). I further certify that the following specification requirements have been fulfilled:

1. Megger readings performed, six (6) copies of logs attached.

2. Ground tests performed, six (6) copies of method used and results attached, including service ground readings and ground fault test results.

3. Operating manuals completed and instructions of operating personnel performed for all systems, (Date) , (Signature, Owner's Representative).

4. Record drawings up-to-date and ready to deliver to Engineer.

5. Fire alarm system final connections, check-out and start-up completed on (Date) by (Signature, Factory Authorized Representative and Trained Technician) .

6. All other tests required by Specifications have been performed.

7. Final clean-up is completed.

8. All systems are fully operational.

Signed:_____

B. Reference Cx Commissioning specification for additional information and requirements.

3.12 SITE OBSERVATION

A. Periodically, the Engineer will visit the site and review the construction progress. Field Reports will be issued noting any discrepancies or items that do not meet the intent of the contract documents found during said site visit. The contractor must answer each item listed on each field report, item by item.

B. It shall be the duty of the Contractor to personally make a careful inspection trip of the entire project, assuring himself that the work on the project is ready for final acceptance before calling upon the Owner, Architect or Engineer to make final acceptance of the work. Subsequent trips required because of Contractor's failure to do so, will be made at Contractor's expense, billed at current Engineer's hourly rates.

C. The final acceptance of the work will be made jointly by the Architect and the Owner.

D. Time spent for Investigation/Site Trips due to Contractor lack of installation capabilities/skills or knowledge is not part of Engineer's scope. Therefore, time spent assisting contractor in these matters or problems that arise due to these matters will be billed to Contractor. Engineer will bill the contractor at the current hourly rates of the Engineer. These fees will be paid in full prior to release of contingency.

3.13 DURING FINAL INSPECTION

A. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents.

B. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.

3.14 CLOSE-OUT DOCUMENTS:

A. Furnish three signed letters of guarantee.

1. Clearly and individually, document all material, equipment and service guarantees beyond a single year.

B. Furnish one original and two copies, of a statement from the inspecting authority stating that the installation has been accepted and approved.

C. Furnish one reproducible, two copies and an electronic “AutoCad” version, of complete, full-size sets of drawings showing conduit locations by accurate dimensions from permanent structures.

1. **“Record** Drawings” are to include:

a. A sheet legend shall be present on the 1st sheet of the required set which identifies each sheet making-up the set.

b. Site plan(s) with primary and secondary electric power and communication lines to the property line (may be a civil sheet).

c. Site plan(s) with all underground conduits to other buildings, structures, fixtures and equipment.

d. Marked-up electrical plans and schedules.

D. Furnish three complete sets of overload settings and motor data records.

E. Furnish three complete sets of the electrical testing results.

F. Furnish three complete sets of the power system study final report.

G. Furnish all manufacturer’s software if required for start-up or modifying products furnished.

H. Furnish two complete sets of the AC Drive’s comprehensive manual that includes operation, programming, diagnostics, applications, wiring diagrams, layout diagrams, and outline dimensions.

1. Identify each AC Drive’s model number on a cover sheet.

I. All major Owner training sessions to be videotaped in non-pixelated video in Windows file format.

PROJECT NAME

MEP/ENERGY CONSULTANTS

HENDRIX CONSULTING ENGINEERS

115 East Main Street COMMISSIONING • FIELD INVESTIGATIONS Round Rock, Texas 78664

PH: (512) 218-0060 FIRM F-4095 FAX: (512) 218-0077

PRE-CONSTRUCTION INSTRUCTION SHEET

Submittal/RFI Requirements

A. 'Individual submittals' means separate submittals with unique submittal numbers. One single giant PDF will be rejected.

B. 2 Submittal CATEGORIES (Reference Specifications)

a. Not required unless deviating from specification

b. PDF allowed.

PDF SUBMITTAL/RFI FILE TITLE REQUIREMENT:
For submittal sections listed below as allowed pdf's the following requirements must be met or the submittal will not get through email security and will be auto-deleted and not checked. Each pdf submittal must be a separate pdf file.

PDF FILE: MUST BE NAMED AS FOLLOWS:
JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION
JOB NAME – RFI No. XX – RFI DESCRIPTION

Example: Texas ISD ES No. 2 – Submittal 8 – Plumbing Fixtures
Example: Texas ISD ES No. 2 – RFI 3 – Library Light Fixture Mounting Height

EMAIL TITLE/SUBJECT REQUIREMENTS:
Emails without Job Name and proper format will not get through email security and will be auto-deleted and not checked.

JOB NAME – SUBMITTAL No. XX – SUBMITTAL DESCRIPTION
JOB NAME – RFI No. XX – RFI DESCRIPTION

C. If submittals are submitted early relative to construction phasing, submittals may be held, reviewed and returned at the appropriate time for construction phasing, not necessarily 2 weeks. In some cases, if submittals are received vastly out of order of construction, submittal may be rejected.

D. Time Critical Submittal Coordination Items

Mechanical to provide to General Contractor for Structural Roof Coordination

a. Mechanical to provide roof opening shop drawing as early as possible for structural coordination. Per specifications.

Mechanical to provide to General and Electrical Contractors for Gear Coordination

b. Mechanical to complete "MECHANICAL/ELECTRICAL COORDINATION SHEET" prior to electrical gear submittals for coordination with electrical contractor. Per specifications.

E. **Do not submit non pre-approved substitutions during submittal time. These submittals will be automatically REJECTED. Substitution Pre-approval was at bid time.**

F. **Review time for multiple resubmittals of non-approved equipment will result in Contractor being billed for review time that is not part of Engineer's Scope. Engineer will bill Contractor at Engineer's Current hourly rates.**

G. **Email of all Submittals/RFI's must go directly to Architect. Do not Copy Engineer.**

H. **Engineer is not the Contractors plan reference resource. Do not submit an RFI until drawings and specifications have been reviewed first. If the answer is clearly on the drawings the response will be "The answer is clearly on the drawings, Engineer is not the Contractors plan reference resource."**

I. **Call before submitting a written RFI.**

J. **All formal Job emails must come from Architect.**

K. **Do not email send recurring jobsite meeting requests to Engineer. Engineer does not attend all weekly meetings. Architect will coordinate when Engineer is to be required at job site for specific meetings.**

Shop Drawings and Cad Files

A. Contractor Shop Drawings must use Architectural Backgrounds and Architectural RCP's (when available or lighting floorplan) and **Mechanical Contractor Shop Drawings** for coordination purposes. Do not request MEP floorplans, this will be cut and paste into an email for you to read. Engineer cannot send architectural backgrounds.

B. If no Architectural RCP is available for light locations. Lighting Floorplans will be released.

C. Mechanical Floorplan will be released to Mechanical Contractor for aid in production of his own shop drawings. HCE mechanical drawings may not be submitted as shop drawings.

D. Fire Alarm, Sprinkler, Intercom etc. all to use Architectural Backgrounds, must be obtained from Architect.

E. Schedule and Details sheets will not be released.

PROJECT NAME

MEP/ENERGY CONSULTANTS

HCE HENDRIX CONSULTING ENGINEERS

COMMISSIONING • FIELD INVESTIGATIONS

SUBSTITUTION REQUEST

FROM: DATE:

PROJECT:

RE:

The following has been submitted for consideration on the aforementioned project:

Specification Title, Section, Page and Article/Paragraph:

Drawings and Details Affected:

Proposed Substitution/Description:

Installer's Name:

Manufacturer's name:

☐ Point by Point Comparative Data attached - REQUIRED BY A/E (_____# of pages including cover)

Why is Substitution Being Submitted?

☐Pre-Bid Substitution (Prior Appoval): Include detailed analysis comparing proposed substitution against specified product, including redlined Specifications showing differences or deviations.
☐Specified product is not available. Explain in detail as attachment.
☐Cost Savings to Owner. Indicate comparative cost analysis as attachment.
☐Other. Explain.

Effects of Proposed Substitution?

(Attach complete explanations and technical data, including laboratory test, if applicable.) Include complete information changes to Drawings and/or Specification that proposed substitution would require for its proper installation. Fill in blanks below:

A. Does substitution affect dimensions shown on drawings? ☐No ☐Yes
B. Will undersigned pay for changes to building design, including engineering and detailing costs caused by requested substitution? ☐No ☐Yes
C. What affect does substitution have on other trades?

D. Differences between proposed substitution and specified item?

E. Indicate how proposed substitution meets LEED requirements. (if applicable)
F. Manufacturer's guarantees of proposed and specified items are:
☐Same ☐Different (explain on attachment)

The Contractor and Subcontractor certifies:
- Proposed substitution has been fully investigated and determined to be equal or superior in all respectes to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Similar maintenance service and source of replacement parts, as applicable is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted By: (name, address, telephone and contact person of manufacturer and installer of proposed substitution)

For A/E Use: SR# _____

☐Accepted ☐Accepted as Noted
☐Not Accepted ☐Received Too Late
☐Incomplete Information
☐No Substitutions Accepted
Reviewed by/date:
Comments:

Subcontractor's signature and date:

Contractor's signature and date:

COPY TO:
☐FILE ☐OWNER ☐CONTRACTOR
☐ENGINEER ☐_____

MEP/ENERGY CONSULTANTS
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PROJECT NAME

MEP/ENERGY CONSULTANTS

HCE HENDRIX CONSULTING ENGINEERS

COMMISSIONING • FIELD INVESTIGATIONS

MECH / ELEC EQUIPMENT COORDINATION SHEET

(THIS IS REQUIRED – NOT OPTIONAL)

MARK #	UNIT TYPE	MANUFACTURER'S RECOMMENDED MOCP	VOLTAGE	PHASE	MARK #	UNIT TYPE	MANUFACTURER'S RECOMMENDED MOCP	VOLTAGE	PHASE

END OF SECTION

PROJECT NAME

SECTION 26 05 10 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall breakdown the final Schedule of Values to be used for pay application into the following minimum categories.

B. ALL CATEGORIES SHALL HAVE APPROPRIATE MATERIAL AND LABOR BREAKDOWN.

C. Definitions:

1. Service: Conduit for utility company and conduit and wire from utility transformer to main switchboard.

2. Feeders: Include all conduit and wire serving transformers and panelboards.

3. Branch Circuit: Any circuit from a panelboard to a utilization device.

4. Gear: Main switchboard, panelboards, transformers, disconnects, etc.

5. Site conduit voice/data.

1.02 SCHEDULE OF VALUES [choose only items below that apply to project]

A. Mobilization

B. Utility Company Fees

C. Service - Wiring and Conduit

D. Site Lighting - Wiring and Conduit

E. Gear

F. Site Lighting Fixtures

G. Interior Lighting Fixtures

H. Branch Circuit - Wiring and Conduit

I. Feeders - Wiring and Conduit

J. Devices (switches and receptacles)

K. Fire Alarm System

L. Sound Systems

M. Emergency Generator/ATS

N. Uninterruptible Power System

PROJECT NAME

O. Testing/Labeling of Equipment

P. Record Drawings and O&M Manuals ($1500 minimum)

END OF SECTION

PROJECT NAME

SECTION 26 05 19 - WIRE AND CABLE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide a complete system of conductors in raceway systems as shown on the drawings and hereinafter specified. Route all wire through an approved raceway unless otherwise indicated, regardless of voltage application.

B. Provide 200% neutral conductors to all panels with 200% neutral specified. Reference Panel Schedules.

C. Provide individual neutrals for each circuit, no shared neutrals allowed.

D. **No de-rating of neutrals allowed.**

1.02 STANDARDS

Provide conductors in accordance with the applicable sections of UL and IPCEA Standards.

1.03 SUBMITTALS

A. Furnish Engineer shop submittals for each type of wire and cable.

B. Provide shop submittals which includes the following information:

1. Insulation type.

2. Insulation temperature rating.

3. Manufacturer

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wire and Cables: (600 Volts)

1. Provide copper wire and copper ground conductors **only**. Conductors shown on plans are thusly sized. **No aluminum conductors** will be allowed unless specifically noted.

a. Minimum wire size for branch circuits shall be #12, however, #14 may be used for motor control circuits where specified on the drawings.

b. All conductors #10 [#12] and smaller shall be solid and #8 [#10] and larger shall be stranded.

2. Provide copper conductors of annealed, 98 percent conductivity soft drawn copper. Provide stranded conductors for control circuits.

B. Metal clad cable shall not be acceptable except from junction box to light fixture, maximum 6 feet in length.

C. Metal-clad cable shall not be acceptable for receptacles.

C. Flexible metal conduit or metal-clad cable for receptacles and branch circuits with the following limitations:

1. Dry interior locations;

2. Feeds one outlet only or first outlet.

3. 20 amp maximum;

4. Both segment ends are located within the same room.

a. One segment end at the outlet box and the other segment end at a ceiling junction box located, within 10 feet of the entrance into the wall cavity, vertically above the outlet served.

5. Where installed in an insulated wall, the cable must be on the conditioned side of the insulation and;

6. Each cable or conduit shall be supplied by only one (1) branch circuit breaker (one, two or three poles).

7. No MC to be horizontal in wall. All horizontal runs must be pipe and wire only.

D. Insulation: (600 Volts)

1. Provide all conductor insulation types rated for wet and dry locations and approved by the National Electrical Code for the particular application. Provide all wire and cable with the following (or better) insulation classes:

   a. All feeders and branch circuits are to be dual-rated Type THHN/THWN **copper** conductors.

   b. Insulation rated for operation at 600 volts.

   c. In areas where the temperature will exceed 167^{O}F, provide wire rated 105^{O}C. minimum and a type approved by the local code. Include any wiring within three feet (3') horizontally or ten feet (10') above any heating appliance.

2. Color code in accordance with the wiring diagrams furnished with equipment. All wiring for control systems to be installed in conjunction with mechanical and/or miscellaneous equipment. Color code by line or phase all branch circuit wiring including circuits to motors and feeders as follows: Wire No. 10 and smaller shall be factory color coded. Wire No. 8 and larger may be color coded by color taping within six inches (6") of exposed ends. **Color coding for each nominal voltage shall be consistent throughout building from point of origination to the termination point including tap conductors to luminaire. Mixing of colors between voltages will not be allowed.**

PROJECT NAME

120/208 Volt	(Austin) 120/208 Volt	120/240 Volts	277/480 Volts
Phase A - Black	Phase A - Red	Phase A - Red	Phase A - Brown
Phase B - Red	Phase B - Black	Phase B – Orange	Phase B - Yellow
Phase C - Blue	Phase C - Blue	Phase C – Black	Phase C - Purple
Neutral - White	Neutral - White	Neutral - White	Neutral - Gray
Ground - Green	Ground - Green]	Ground - Green (Orange is High Leg)	Ground - Green

E. Wire and Cable: (50 volts or less)

1. Provide copper wire, minimum size #18 AWG for controls, #18 AWG minimum for fire alarm and #20 AWG minimum for communications. All wire and cable shall be solid. Stranded conductors are not acceptable.

2. All conductors shall be routed in conduit or shall have an insulation approved for plenum installation, unless otherwise noted.

F. ROMEX not allowed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Unless otherwise indicated, wiring size noted on the drawings extends for the entire length of a circuit. Install wire in raceways in strict conformance with the manufacturer's recommendations. Use a UL approved wire-pulling lubricant. Strip insulation so as to avoid nicking of wire.

B. Wire Connections and Devices:

1. Provide all terminating fittings, connectors, etc., of a type suitable for the specific cable. Make all fittings up tight. Make up all terminations in strict conformance with manufacturer's recommendations using special washers, nuts, etc., as required.

2. Connect No. 8 and larger wire to panels and apparatus with properly sized, solderless, or compression lugs or connectors.

3. Join No. 10 and smaller wire by twisting tight and applying UL listed twist-on connectors.

4. Leave at least an eight inch (8") loop of wire for ends at each outlet box for the installation of fixtures or devices.

C. Flashover or insulation value of joints shall equal that of the conductor. Provide connectors rated at 600 volts for general use and 1000 volts for use within fixtures.

D. Grouping shall be 3 Hots and 3 Nuetrals or 6 Hots max. Derating shall be based on the 90 degree chart of NEC 310-16 and table 310.15 (B)(2)(2).

E. Where the distance between the supplying panel and the first branch circuit receptacle, light fixture or equipment is more than 100 feet, upsize wire to allow for maximum of 3% voltage drop for actual routing of conduit to device.

F. Wiring for emergency systems shall be kept entirely independent of all other wiring and equipment as required by Article 700 of the NEC.

G. Mechanically protect conductors by installing in raceways. Do not install the conductors until raceway system is complete and properly cleaned. Use an approved wire-pulling compound when pulling conductors. Wiring pulling compound shall be listed and as recommended by the conductor manufacturer. Do not bend any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of the insulated conductors. Do not exceed manufacturer's recommended values for maximum pulling tension.

H. Pull conductors simultaneously where more than one conductor is being installed in the same raceway.

I. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway.

J. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A.

K. Neatly and securely bundle all conductors in enclosures using nylon straps with a locking hub.

L. At least 6 inches (measured from the finished surface) of each conductor shall extend outside a box's opening.

3.02 SPLICES AND TERMINATIONS

A. Splices shall be kept to a minimum.

B. Splices shall be made in junction and/or pull boxes.

1. Splices in conduit fittings (i.e., conduit bodies), and in panelboards are not acceptable.

C. All materials shall prevent corrosion or electrolysis between dissimilar metals.

D. Use terminal blocks within a junction box for all splices of No. 6 and larger conductors.

E. Use mechanical, crimp or compression type connectors for terminations of stranded conductors.

3.03 CONDUCTOR SIZING

A. Install conductor size required by the more stringent requirements of the drawings or specifications.

B. Install No. 10 AWG conductors the entire length of the circuit for single-phase, 120-volt, 20-ampere branch circuits for which the distance from panelboard to the first outlet is more than 100 feet.

C. Install No. 10 AWG conductors the entire length of the circuit for single-phase 277 volt, 20-ampere branch circuits for which the distance from panelboard to the first outlet is more than 200 feet.

PROJECT NAME

D. General use circuit numbers may be changed. Equipment circuits have numbering to balance loads. This contractor is responsible for maintaining a balanced load and recording the actual circuit numbers.

E. Comply with ampacity adjustment factors as required by the NEC Article 310-16.

3.04 TESTING

A. Prior to energizing feeders, perform insulation resistance tests at 500 Volts D.C. for 30 seconds on each cable with respect to ground and adjacent cables. Maintain the following log for feeder tests:

FEEDER DESCRIPTION:_____

TESTER'S NAME:_____

TEST INSTRUMENT SERIAL #:_____

TEST DATE:_____

RESISTANCE:

A-B	A-C	A-G	B-C	B-G	C-G

B. Test all circuits for proper neutral connections.

C. Upon completion of all testing, prepare a detailed report of all voltage and insulation resistance measurements. Deliver report to Engineer with request for final inspection.

END OF SECTION

This page is intentionally left blank.

PROJECT NAME

SECTION 26 05 26 – GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide a complete grounding system in strict accordance with Article 250 of the National Electrical Code and as hereinafter specified and shown on the Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide copper clad 5/8” x 8 ft. - 0” long ground rods, appurtenances, bonding plates, clamps, connectors and grounding conductors as required. Furnish rods to which the copper cladding is permanently and inseparably bonded to a high strength steel core.

2.02 CONNECTORS

A. Provide exothermic weld type ground connections for concealed, underground, and concrete encased ground connections.

B. Exposed connections may be made with copper or bronze bolted or compression lugs.

2.03 INTER-SYSTEM GROUNDING BUS-BAR (communications)

A. Provide surface mounted terminal blocks sufficient to except 20 individual conductors of sizes 14 AWG thru 4 AWG.

2.04 CONDUCTORS

A. Furnish copper conductors.

B. Furnish 600-volt, insulated conductors for equipment grounding.

C. Size the system grounding electrode conductors to comply with NEC section and table 250-66, unless shown larger.

D. Size the main and separately derived system bonding jumpers to comply with NEC section 250-28 (D).

E. Size equipment grounding conductors to comply with NEC section and table 250-122, unless shown larger.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Properly ground all service equipment conduit systems, supports, cabinets, equipment, motor frames, fixtures, etc., and the grounded circuit conductor in accordance with the latest issue of the National Electrical Code. Provide all bonding jumpers and wire, grounding bushings, clamps, etc., as required for complete grounding. Route ground conductors to provide the shortest and most direct path to the ground electrode system. Bond conduit if made of

current conducting material. All ground connections shall have clean contact surfaces. Bond the service equipment to a grounding electrode as shown on the Drawings.

B. Provide a grounding type bushing for all feeder and branch circuit conduits which do not have a grounding conductor and individually bond this raceway to the enclosure's ground bus or lug.

C. Provide a grounding type bushing on the end of each isolated section of metal conduit and bond the conduit to the equipment grounding conductor, or using a conductor of the same size, bond directly to the equipment ground buss of the equipment at the end of the run.

D. Make single or dual connections to ground rods, plates, and other buried connections by the exothermic process (Cadweld) or Burndy Hyground TM Compression Systems and "hammer tested" to insure that a good bond has been made. Alternatively, all below grade compression grounding systems must meet all UL467, CSA, IEEE837 test requirements and conform to the National Electrical Code Standards. The material at the connectors shall be pure wrought copper extrusions, rod and seamless tubing and be identical material to the conductor. Connectors must be of heavy duty design and be of range taking design to accept conductor ranges of #6 solid to 500 Kcmil plus 5/8" ground rods. Compression connectors need to be compressed with system engineered tooling which makes a circumferential or round crimp. Hex crimp is not acceptable due to sharp flashes and spurs that may occur. Each connector must be clearly marked with catalog number, conductor size and installation die information. Inspection ports must be provided on lug terminations and splices. The system must emboss all the appropriate die index numbers on all connectors after completion of the crimp. Connectors must be prefilled with penetrox copper type oxidation inhibitor and be individually sealed in clear polyethylene sheet to keep out dirt and contamination.

E. Drive grounding electrodes as required. Where rock is encountered, grounding plates of copper, 1/4-in. x 24-in. x 24-in may be used in lieu of grounding rods. Plates must be installed at 36" minimum below finished grade.

F. Connect grounding electrode conductor to building steel and metallic waterline per NEC 250-81. Allow a minimum of 25 feet of grounding conductor in foundation footing and make 3 connections to Rebar. Connections shall utilize an acceptable compression method with connectors listed for contact with respective metal types.

G. Provide a grounding terminal pad in all panelboards, switchboards, and other electrical equipment.

H. Directly ground to the work piece welding machines used in construction. The use of the building or equipment steel or conduits of any kind as a common ground point is not allowed under any conditions. Contractor is responsible for any electrical pieces of equipment damaged by not using the welder grounding method described above.

I. Provide a green insulated grounding conductor in all conduit serving receptacles and/or equipment. Refer to panelboard schedules for sizing.

J. Ground all receptacles to outlet box with a conductor.

K. Flexible conduit will not be allowed as a grounding means.

L. Install metallic fittings on clean contact surfaces to ensure electrical conductivity.

M. Tighten connectors, terminals, screws and bolts, in accordance with manufacturer's published torque tightening values or comply with torque tightening values specified in UL 486A to assure permanent and effective grounding.

N. Apply a corrosion-resistant finish to places where factory applied protective coatings have been damaged.

O. Protect all exposed, grounding electrode conductors with Schedule 40 PVC nonmetallic conduit.

1. Grounding electrode conductors shall not be protected with metallic materials.

3.02 GROUNDING ELECTRODE SYSTEM

A. At each building's service or disconnecting means, install a grounding electrode system which includes;

1. A concrete encased electrode connected to the concrete reinforcing bars and;

2. The building structural steel and;

3. The building's metal underground (10 ft.) water pipe.

a. This connection must be within the first 5 ft. of the water pipe's entrance into the building. Water piping cannot be the sole ground and must be supplemented.

4. Other electrodes such as a rod, plate or ring may be used to supplement but cannot be used as a substitute.

B. At each grounded separately derived system, install a grounding electrode conductor to connect the grounded (XO-neutral) conductor to;

1. The nearest one of the following electrodes:

a. An effectively grounded structural steel member or;

b. An effectively grounded metal underground (10 ft.) water pipe.

1) This connection must be within the first 5 ft. of the water pipe's entrance into the building.

2. If neither of these is available, install a 3/0, copper, common grounding electrode conductor from the building's service or disconnecting means. Connect taps from this common grounding electrode conductor to the separately derived system's grounded (XO-neutral) conductor.

3.03 SYSTEM BONDING

A. SERVICES

1. Install a main bonding conductor between the service ground bus and the grounded (neutral) bus-bar.

B. SEPARATELY DERIVED SYSTEMS

1. Install a bonding jumper between the equipment ground bus and the separately derived electrical system's (transformer, UPS, central battery/inverter or generator) grounded (XO-neutral) bus.

3.04 ADDITIONAL BONDING

A. Install 3/0 AWG bonding jumpers around all structural metal expansion joints.

B. Each building's interior metal water piping system which does not qualify to be used as a grounding electrode shall be bonded to the building's service or disconnecting means.

C. Bond the grounded (XO-neutral) conductor of each separately derived system to the nearest available point of the interior metal water piping system(s).

1. When the structural steel is being used as the grounding electrode for the separately derived system, the interior metal water piping system(s) may be bonded to the structural steel.

D. Install bonding jumpers around raceway expansion joints.

E. Install bonding jumpers around insulated water pipe joints.

F. Install a bonding jumper between all grounding electrodes used for communications, radio and television or antenna systems and the building's grounding electrode system.

3.05 COMMUNICATION GROUNDING

A. Provide a surface mounted, inter-system grounding bus-bar at the service equipment or a separate building's disconnecting equipment and in each communications room.

B. At the service or separate building's disconnecting means, provide an insulated 6 AWG, stranded conductor to connect the inter-system grounding bus-bar to the equipment ground bus.

C. At communications rooms, provide an insulated 6 AWG, stranded conductor to connect the inter-system grounding bus-bar to the building's structural steel.

3.06 EQUIPMENT GROUND

A. Raceways shall not be used as the sole equipment ground.

B. Bond the equipment grounding conductors to all boxes and enclosures.

C. Each receptacle shall be bonded to its respective device box. The connection shall be made by means of a bonding jumper between the device and the box. Where the receptacle mounting yoke is designed and listed for the purpose of grounding, the bonding jumper may be omitted. This does not substitute for the need of grounding the outlet box.

D. Each isolated ground receptacle shall have an isolated ground conductor installed complete from receptacle to the isolated ground bus in the panelboard. No other grounding connections shall be made to these receptacles, specifically connections to the device box or raceway system.

PROJECT NAME

3.07 TESTING

A. Following completion of installation, test system ground for continuity and test resistance to ground by “fall of potential” method and all feeders or sub-feeders with appropriate meggers, or other approved instruments and methods, to determine ground and insulation resistance values.

B. Submit logs of values obtained, nameplate data of instruments used and instrument calibration data prior to final inspection. Instruments used are subject to acceptance.

END OF SECTION

This page is intentionally left blank.

PROJECT NAME

SECTION 26 05 29 – HANGER & SUPPORTING DEVICES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all required supporting devices, including but not limited to channels hangers, brackets, fittings, clamps, hardware, anchor bolts, rods, electrical accessories, etc., for conduit and equipment.

1.02 STANDARDS

A. Conform with the latest requirements of the NEMA and The National Electric Code.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Support Channel: Hot-dipped galvanized steel, sized for load, minimum size 12 gauge, 1-5/8 wide by 13/16 deep. Furnish fasteners sufficiently sized to carry load imposed.

B. Hardware: Corrosion Resistant (Hot-dipped galvanized all steel components)

C. Support Wires (16 Ga. Minimum) and Tie Wires (22 Ga. Minimum) or as required by UL listed assemblies: Galvanized Steel

D. Coatings: All steel components shall be hot-dipped galvanized.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Perforated iron straps are not permitted for supporting conduits. Conduits run between the webs of bar joists may use galvanized tie wire for securing the conduits. Cut excess wire and bend ends to prevent sharp ends.

B. Support horizontal and vertical conduit runs by one-hole straps, clamp-backs or other acceptable devices and suitable bolts. All conduits shall be secured to structure with supporting devices dedicated for the electrical system and/or conduits for systems furnished under the Electrical Contractor responsibilities. When two (2) or more conduits are run parallel, they may be supported on trapeze hangers, equal to the Modern Co. Other hangers shall be constructed with rods and hanger adjusters of adequate size to carry the loads imposed.

C. All conduits shall be supported a maximum of ten feet (10’) on center. Also, support conduits within twelve inches (12”) of any bends, outlet boxes, wall penetrations or joints in pipe. All conduits shall be secured to structure. Lighting fixture whips may not be secured to ceiling tie wires. Vertical risers shall be supported by approved riser clamps or supports installed at the respective floor lines

D. Conduits routed below bar joists shall utilize acceptable clamps.

E. Fasten hanger rods, conduit clamps and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, or beam clamps. Do not use spring steel clips and clamps. Submit method of attachment for review prior to commencing work.

F. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheetmetal screws in sheetmetal studs; and wood screws in wood construction.

G. Do not fasten support wires to piping, ductwork, mechanical equipment or conduit.

H. Do not fasten conduit or junction boxes to ceiling grid wire. All conduit must be independently supported.

I. Support recessed fluorescent light fixtures with support wire at all four corners as required by roof/ceiling assembly. If roof/ceiling assembly does not require supports at each corner, support fixtures with minimum of two support wires at diagonally opposite corners. Spray paint ends of fixture support wires orange.

J. Conduits, except as approved by NEC, shall not be used to support low voltage cables.

K. Support all piping on roof with pipe stands/roller equal to MIRO Industries Model 4-RAH-PC or Portable Pipe Hangers, Inc., Type PP10 with roller for conduit 2-1/2” and smaller. For conduit over 2-1/2”, up to and including 4” use MIRO Industries Model 6-RAH-PC or Portable Pipe Hangers, Inc. (PPH) Type PS-1-2. All conduit stands to sit on walk board (coordinate type and methods of support with Roofing Contractor). Provide minimum pipe height above roof deck as required by jurisdiction having authority (at least 3-1/2”). Provide supports for piping under 2” at six feet on center. Provide supports for conduit 2” and over at eight feet on center.

L. Provide all angles, unistrut supports and threaded rods under any structural elements or mechanical equipment where required for proper placement and support of light fixtures and/or conduits.

M. Supports and hangers shall be installed to permit free expansion and contraction in the raceway systems. Where necessary to control expansion and contraction, the raceways shall be guided and firmly anchored. Anchors shall be approved by the Engineer and shall be designed for equal effectiveness for both longitudinal and transverse thrust. No conduit shall be self-supporting, nor shall it be supported from equipment connections. Transmission of vibrations, noise, etc., shall be considered and any special suspension with vibration dampers to minimize transmission shall be used where necessary.

N. Where ducts interfere with the proper location of hangers, furnish and install trapeze hangers. Trapeze hangers may be used to support groups of conduit run in parallel.

O. Install metal framing to support wall mounted equipment and wall or ceiling mounted raceways.

P. Install expansion bolts to attach framing to concrete. Space bolts a maximum of 24 inches on center, with not less than two bolts per piece of framing.

Q. Touch up all scratches or cuts on steel components with an approved zinc chromate or a 90 percent zinc paint.

PROJECT NAME

END OF SECTION

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PROJECT NAME

SECTION 26 05 33 - RACEWAYS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Provide a complete conduit system as shown on the drawings and as hereinafter specified.

1.02 STANDARDS

Conform with the latest requirements of the NEMA, the National Electrical Code, and be UL listed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Rigid Metal Conduit (RMC): Hot-dip galvanized, threadable steel raceway, galvanized after fabrication. Fittings shall be malleable iron, either cadmium plated or hot-dip galvanized.

B. Intermediate Metal Conduit (IMC): Conduit shall be similar to rigid steel conduit except thinner wall. Fittings shall be malleable iron, either cadmium plated or hot-dip galvanized.

C. Electrical Metallic Tubing (EMT): EMT shall be made of hot-dip galvanized strip steel. Fittings shall be steel or die cast compression or set screw type.

D. PVC - Schedule 40 and Schedule 80 polyvinyl chloride conduit (PVC Duct) shall be UL rated. Conduit fittings and cement shall be produced by the same manufacturer and approved for such use.

E. Flexible Metal Conduit (FMC): Spirally wound continuously interlocked zinc coated strip steel. Fittings shall be steel or die cast zinc, either screw-in or squeeze type.

F. Flexible Conduit (LFMC): Liquid-tight (vibration and/or wet areas) fabricate from continuous lengths of spirally wound galvanized steel strip interlocked with a gray polyvinyl chloride cover extruded over the core to make the conduit liquid tight, oil proof and bendable to a small radius. Fittings shall be compression type, steel or die cast zinc, with insulated throat.

G. Metal-Clad Cable (MC): Galvanized interlocking steel armor. 600 volt, type THHN/THWN, integrally colored insulation. Size #12 AWG or #10 AWG, copper conductors. Fittings shall be listed for MC usage and include anti-short bushings. Reference Section 3.03 for acceptable uses.

H. Metal Wire-ways.

1. Furnish with wire retainers on not less than 12 inch centers. All screws installed towards the inside shall be protected to prevent possible wire insulation damage.

2. The finish shall be the manufacturers' standard color and shall consist of not less than two coats of enamel over a rust-inhibiting prime coat.

I. Surface Metal Raceway (2000 series).

1. Surface metal raceway shall consist of a single compartment base, blank cover, and appropriate fittings to complete the installation per the electrical drawings.

2. The base and cover shall be manufactured of steel and finished with a white color.

3. Approximately ¾" deep, 1 ¼" high and 5' sections.

J. Non-Metallic Multi-outlet Assemblies (5400 series).

1. Surface raceway system shall consist of a dual compartment raceway base, twin cover, appropriate fittings, outlets and device mounting plates necessary for a complete installation.

2. Duplex receptacles and data outlets ("activate connectivity inserts") mounted at 24" centers or as noted on plans. Connect adjacent receptacles on alternate circuits.

3. Approximately 1 ¾" deep, 5 ¼" high and 8' sections with equal compartments.

4. The finish shall be white color and shall consist of not less than one coat of enamel over a prime coat.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Raceway and cable usage and installation shall conform to the appropriate article of the National Electrical Code (NEC), as a minimum.

B. Do not install conduit that is crushed or deformed in any way.

C. Provide a nonmetallic (nylon, polypropylene, or approved equal) drag line of suitable strength in spare conduits and telephone conduits. Tightly plug spare conduits at both ends.

D. Do not pull wire into conduit system until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed.

E. No wiring systems of any type shall be installed in ducts used to transport dust, loose stock, or flammable vapors.

F. No wiring system of any type shall be installed in any shaft containing ducts used for vapor removal or for ventilation of commercial-type cooking equipment.

G. Fasten and support the wiring method employed to the permanent structure using listed straps with corrosion resistant hangers and fasteners.

H. Ceiling system wires or lay-in type ceiling grid components shall not be used as a means of support.

1. Independent support wires and associated fittings which are installed in addition to the ceiling system support wires, shall be permitted: (300.11.A)

2. Independent wires within the cavity of a fire-rated floor–ceiling or roof–ceiling assembly shall be distinguishable by color. (300.11.A.1)

3. Independent support wires that provide support for device boxes shall be secured at both ends. (300.11.A).

I. Bends shall be made with factory elbows or field bent. Field bends shall be made using equipment designed for the particular raceway material and size. Bends shall be free from dents or flattening.

J. Conduit bodies may be used in lieu of conduit elbows where covers will be accessible, and ease of installation and appearance warrants their use.

K. Install expansion-deflection fittings where raceways cross structural expansion joints or where required to compensate for thermal expansion and contraction. Install bonding jumpers across expansion-deflection fittings in metal raceway systems.

L. Openings through fire-resistant-rated or sound-resistant-rated walls, partitions, floors or ceilings shall be fire-stopped by installing raceways or cables through sleeves set through the walls, partitions, floors or ceilings and fire-sealing all openings and voids around the sleeves, raceways and cables.

M. Do not drill or pierce structural steel members under any circumstances without the Engineer's specific approval.

N. Minimize roof penetrations by routing conduit through the equipment roof opening. If roof penetration is necessary, coordinate with the Architectural Specifications and penetrate as directly below the equipment disconnect or wiring connection point as possible. Do not use flexible conduit in a pitch pan.

O. Arrange all conduits to drain away from the building.

P. Perform all necessary excavation and backfilling. Tamp backfill in six inch (6") layers to original grade, moistening as required for proper compaction. All backfilling shall be free from harmful materials. Provide shoring, bracing, and de-watering as necessary. Remove all excess and materials not suitable for backfill from the site. Provide barricades to prevent endangering the public. Provide warning beacon lighting at night to adequately mark all excavations.

Q. A tracer tape wire shall be installed in all trenches which do not contain conductive conductors within them. This will include future use raceways, optical fiber, etc.

R. Raceway systems shall be complete before installing conductors.

S. The interior of all raceways shall be cleaned before installing conductors.

T. Terminate future use raceways with a capped coupling within an accessible area.

U. Workmanlike manner: Type MC cable shall be installed in a neat and workmanlike manner. Cable shall not cross other cable or have excess slack. Cable that is installed vertically, must be plumb with the vertical framing of the structure.

V. Bundling of cable is limited to three cables for each support ring.

W. Type MC cable may be only supported by fasteners or clamps that are approved and UL tested for cable support.

3.02 INSTALLATION BELOW GRADE

A. Minimum size raceway is 3/4 inch.

B. Provide rigid galvanized steel conduit or PVC where conduits are installed in concrete floor slab ¾" maximum. Maintain proper concrete coverage as directed by structural engineer. PVC conduit shall not penetrate slab above finished grade.

C. Provide rigid galvanized steel or PVC conduit where conduits are installed below grade.

D. Swab clean all conduits before cable installation. Waterproof all conduit joints after cable installation.

E. Provide conduit wall sleeves for all conduits penetrating walls, grade beams, etc. and other locations shown on the Drawings.

F. Where required to bend PVC ducts to satisfy indicated routing, preform ducts to allow ends of duct sections to be in a straight alignment. Accomplish preforming of ducts by utilizing proper duct heater units.

G. Perform all necessary excavation and backfilling for proper installation of work. Take precautions not to excavate below depth required. Backfill trenches with sand, 3" below conduits and 3" above. Tamp remainder of backfill in six inch (6") layers to original grade, moistening as required for proper compaction. All backfilling shall be free from harmful materials. In areas to be paved, compact to density to receive pavement. Where pavement is broken for the installation of conduit, repair to original condition. Provide shoring, bracing, and de-watering if necessary for installation of work. Remove from site all materials encountered which are not suitable for backfill.

H. When and if damage is caused to underground utility lines or structures, above ground utility lines or structures, or other purposeful surface conditions, either on or off the right-of-way, make immediate temporary repairs. At the first opportunity, make permanent repairs which are acceptable to the Owner. All such repairs shall be made at the Contractor's expense.

I. Where necessary, provide barricades around open excavations to prevent endangering the public. Provide warning beacon lighting at night to adequately mark all excavations.

J. Where conduits embedded in concrete floor or roof deck cross expansion joints, they shall be joined together using O.Z. Gedney type DX expansion fittings and bonding jumpers. Straight runs of conduit over 150' long shall have O.Z. Gedney Type AX expansion fittings installed to minimize movement. Fittings shall be installed at a maximum of 150' on center.

K. Where horizontal runs of conduit transition to vertical and continue above finished grade or finished floor; the transition shall be made with a 90 degree long radius sweep. The sweep may be PVC (2" and smaller) and shall be RMC (2-1/2" and larger). No PVC conduit will be allowed above finished grade or finished floor.

L. CONDUITS RUN BELOW FINISHED FLOOR SHALL NOT PENETRATE GRADE BEAMS. UNLESS APPROVED BY STRUCTURAL ENGINEER.

3.03 PERMITTED RACEWAY USAGE:

A. Raceway transitions at all locations;

1. Rigid nonmetallic conduit runs from below grade level shall transition to galvanized rigid steel or intermediate steel conduit, wrapped with corrosion protection tape, prior to exiting at grade level and continue thereafter in accordance with their usage requirements.

a. Caulk concrete-to-conduit joints with a silicone rubber compound.

2. Continue the more protective conduit type into an area where a less protective conduit type is permitted for a distance of not less than 1 foot.

B. Electrical metallic tubing at;

1. Interior locations when;

a. Concealed within walls and ceilings or; **do not use in the mortar filled cells of concrete masonry units.**

b. Exposed and more than 8 feet above finished floor or;

c. Exposed and more than 3 feet above finished floor in electrical or mechanical rooms or;

d. Exposed and more than 1 foot above a finished attic or mezzanine floor.

e. Do not use where exposed to standing water or other continuously damp or wet areas.

2. Exterior locations when;

a. More than 10 feet above the finished ground surface or;

b. More than 1 foot above the finished ground surface within a lockable equipment yard or;

c. In the crawl space below a building with the 1st level elevated.

C. Rigid or intermediate metal conduit at;

1. Interior locations when;

a. Exposed, in other than electrical or mechanical rooms, and installed less than 8 feet above finished floor or;

b. Exposed in electrical or mechanical rooms and installed less than 3 feet above finished floor or;

c. Exposed and less than 1 foot above a finished attic floor or mezzanine floor.

2. Exterior locations when;

a. Less than 10 feet above the finished ground surface or;

b. Less than 1 foot above the finished ground surface within a lockable equipment yard.

1) Malleable iron straps will be required at these locations.

D. Rigid metal and intermediate metal conduit wrapped with corrosion protection tape or rigid nonmetallic conduit at;

1. Underground locations with a ¾” minimum size when;

a. Located outside of the building line or;

b. Located below a concrete slab on grade or;

c. Located below a beam of a slab on grade or.

d. Located within a concrete slab on grade where the outside diameter is equal to or less than 20 percent of the slab thickness.

1) Seal conduit ends at each building entry.

2. Below grade;

a. The minimum size shall be 3/4 inch.

b. Seal conduit ends at each building entry.

c. Coordinate covering with Structural Engineer.

E. Rigid nonmetallic conduit for;

1. An exposed grounding electrode or bonding conductor below 10 ft. to guard from physical damage.

F. Flexible metal conduit in;

1. Dry interior locations with a minimum length of 2 feet and maximum length of 6 feet to;

a. The final connection of transformers, motors and vibrating equipment.

G. Flexible metal conduit or metal-clad cable for light fixtures or ceiling mounted devices.

1. Dry or damp interior locations with a maximum length of 6 feet to;

a. The final connection of light fixtures; or

b. The final connection of ceiling mounted outlet boxes or.

H. Flexible metal conduit is not allowed for any technology rough-in, must be EMT.

I. Flexible metal conduit or metal-clad cable with the following limitations for receptacles and branch circuit.

1. Dry interior locations;

2. Feeds one outlet only;

3. 20 amp maximum;

4. Both segment ends are located within the same room.

a. One segment end at the outlet box and the other segment end at a ceiling junction box located, within 10 feet of the entrance into the wall cavity, vertically above the outlet served.

5. Where installed in an insulated wall, the cable must be on the conditioned side of the insulation and;

6. Each cable or conduit shall be supplied by only one (1) branch circuit breaker (one, two or three poles).

7. No MC to be horizontal in wall. All horizontal runs must be pipe and wire only.

J. Liquid-tight flexible metal conduit in;

1. All locations with a minimum length of 2 feet and maximum length of 6 feet for;

   a. The final connection of all liquid pump motors and associated control connections or;

2. Damp or wet interior and all exterior locations with a minimum length of 2 feet and maximum length of 6 feet to;

   a. The final connection of transformers, motors, and vibrating equipment.

END OF SECTION

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PROJECT NAME

SECTION 26 05 34 - OUTLET BOXES, PULL BOXES AND JUNCTION BOXES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Provide outlet boxes in accordance with the National Electrical Code at locations shown on the Drawings and hereinafter specified.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide standard hot-dipped galvanized pressed steel boxes, minimum 4"x4" by 1-1/2" deep. Use 4 11/16" by 2 1/8" deep box when using 1" conduit.

B. Cabinets with screw covers or as specifically noted for junction or pull boxes larger than 150 cubic inches.

C. All junction, pull and splice boxes to conform to NEC Article 314.

D. All metallic boxes are to have an internal means of grounding.

E. Flush mounted wall and finished ceiling boxes.

1. Within framed, drywall, plastered or tile covered walls, with ¾" max. raceway, furnish galvanized steel, 4" square, minimum 1 1/2 inch deep boxes with a raised tile cover and a far-side support.

2. Within drywall or plaster covered or suspended ceilings, with ¾" max. raceway, furnish galvanized steel, 4" square, minimum 1 1/2 inch deep boxes with a raised tile cover.

3. Within masonry walls, with ¾" max. raceway, furnish galvanized steel boxes, minimum 2-1/2-inch deep.

F. Surface mounted boxes.

1. Mounted at or below 10' above the finished surface, ¾" max. raceway size, furnish cast aluminum boxes with a surface mounted cover.

G. Junction and Pullboxes.

1. Furnish, minimum 4" square, 1 – ½" deep, galvanized steel junction and pullboxes where installation conditions warrant their use. Boxes shall be furnished with screw-on covers or hinged covers. Covers shall be such that it can easily be handled by one person. All hardware and fasteners shall be galvanized steel.

H. Flush mounted floor boxes.

1. Furnish adjustable, concrete tight, corrosion resistant, duplex type. Compartmental type for combination receptacle and communication. The coverplate shall be brass with hinged flap and carpet flanges. The minimum below ground/slab conduit size shall be ¾".

PROJECT NAME

I. Underground boxes.

1. U. L. listed.

2. Pre-cast, polymer concrete.

3. Minimum size of 10” W X 10” L X 10” H.

4. Bolt down cover.

5. Stainless steel hex-bolts and replaceable nuts.

6. Minimum load rating of 5,000 lbs. (select by location)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Through wall boxes and boxes mounted back-to-back are not permitted. Provide 8 inch minimum separation in order to minimize sound transmission.

B. Set flush with wall or ceiling finish in accordance with N.E.C., Article 314. Extension sleeves are not permitted for boxes improperly set.

C. Verify location of outlets prior to rough-in. When necessary, relocate outlets to avoid interference with other work or equipment. Where fixtures are mounted on or in an accessible type ceiling, provide a junction box and extend flexible conduit to each fixture. Fit outlet boxes in finished ceilings or walls with appropriate covers.

D. Where more than one (1) switch or device is located at one (1) point, unless otherwise indicated, provide gang boxes and covers. When the voltage between switches exceeds 300 volts, provide barrier partitions between adjacent switches located in the same box. Sectional switch boxes or utility boxes not permitted.

E. Provide pressed steel boxes for all interior work. Provide square boxes with plaster rings. Provide appropriate size multi gang box for group devices. Single gang boxes screwed together is not acceptable.

F. Where boxes are installed in masonry walls, use only approved masonry type boxes for single gang and multi-ganged applications. Standard 4” square boxes with plaster rings are not allowed. Caulk around joint between receptacle box and masonry. Verify color with architect.

G. Do not drill and pierce structural concrete members and structural steel without prior approval of the Engineer.

H. Mount all boxes plumb.

I. Mount boxes completely rigid without conduit or finished wall support.

J. Where outlets are installed in steel stud type systems, provide additional cross bracing, bridging, and/or straps as required to make the outlet completely rigid. Support boxes with “caddy screw gun brackets”, “caddy box mounting bracket”, “caddy quick mount box brackets” or acceptable alternates.

K. **Dimensions are from finished floor to centerline of outlets.** Adjust heights of outlets in masonry walls from that indicated so that receptacles are not lower than 16" A.F.F. and switches are not higher than 48" A.F.F. Outlet height so adjusted shall be consistent. Unless otherwise indicated, mount outlets at the following heights:

Wall switches/Wall Phone	4 ft. - 0 in.
General Duplex receptacles	1 ft. - 6 in.
Receptacles at Millwork	verify with millwork
Receptacle for Refrigerators	2 ft – 6 in.
Weatherproof duplex receptacles	1 ft. - 6 in.
Telephone/Data outlets/Teacher Station	1 ft. - 6 in.
Telephone/Data at millwork	verify with millwork
Garages/Apparatus Bay receptacles	2 ft. - 0 in.
Clocks	8 ft – 0 in
Access Point Data Drops (wall mounted)	10 ft – 0 in

L. For boxes installed above ceilings, label the box cover with the circuit numbers installed. Labeling shall be with a permanent, black maker with broad tip.

M. Boxes installed in rated walls shall have a minimum horizontal separation of 24". Maximum surface area of boxes shall not exceed 16 square inches.

N. Completely envelope floor boxes in concrete except at the top. Increase slab thickness at boxes if required for bottom covering. Adjust covers flush with finished floor.

O. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical pattern with all tops at the same elevation. Where outlets are indicated adjacent, but with different mounting heights, line up outlets to form a symmetrical vertical pattern on the wall.

P. Install recessed boxes flush to the finished wall or ceiling line by the use of manufactured tile rings to extend the box forward.

Q. Boxes to which light fixtures or pendants are mounted shall NOT contain any conductors foreign to the operation of such light or pendant application. Removal of lights, pendants and cord drops to access other branch circuits is NOT acceptable.

R. Where fixtures are mounted on or in an accessible type ceiling, provide a junction box and extend flexible conduit to each fixture.

S. Install knockout closures to cap all unused openings.

T. All boxes shall be installed with coverplates.

U. Install boxes as required to facilitate conductor installation in raceway systems. Junction and pull boxes shall be sized to accommodate conductors, splices, devices and fittings per NEC 314.16.

V. Raceways are NOT allowed to terminate to extension rings.

W. Install boxes so that covers are accessible and easily removable after completion of the installation. The minimum clear space in the direction of the box opening shall be 36”.

X. Include suitable access doors, with the proper fire rating, for boxes above inaccessible ceilings. Boxes shall be located within reach of the access.

Y. Install underground boxes with cover slightly above finished grade.

Z. Spray paint J-Boxes red for Fire Alarm Systems. All other special system J-Boxes to be painted white.

END OF SECTION

PROJECT NAME

SECTION 26 05 80 - EMPTY RACEWAY ROUGH-IN

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install all equipment, accessories and material required for the rough-in of empty raceway systems in accordance with the specifications and drawings.

B. Rough-in raceway sections for indicated devices and outlets in all walls, floors and underground sufficient to facilitate installation of the following systems without cutting or otherwise damaging walls, ceilings or floors installed in this contract:

1. Communications
2. Fire Alarm
3. Television
4. Data
5. Security
6. Controls

C. **ALL** CONDUITS SHALL HAVE A PULL CORD INSTALLED. INSTALL BLANK COVERS ON ALL UNUSED JUNCTION BOXES.

D. 3/4” CONDUIT MINIMUM.

E. Electrical Contractor shall provide all conduit, junction boxes and outlet boxes for HVAC controls as specified in Section 26 05 00, 1.03, D. Coordinate locations and requirements with Mechanical Contractor and Controls Contractor prior to rough-in. Provide outlet box for sensor and conduit to above accessible ceiling. Provide conduit for all wiring in areas with no ceiling. Provide conduit from outdoor units to above accessible ceilings. Provide conduit between make-up air units and associated condensing units.

F. REFERENCE TECHNOLOGY DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS CONCERNING CONDUIT ROUGH-IN FOR VOICE/DATA SYSTEMS.

G. Floor mounted devices: Provide pathway to nearest accessible ceiling for all floor mounted devices called for in this specification.

1.02 QUALITY ASSURANCE

A. Construct each item of equipment, including parts and accessories, in a workmanlike manner, using new materials or the best quality obtainable for the purpose intended. Design and build materials in accordance with the best practices of the electrical industry.

B. Comply with all requirements of serving utility.

PROJECT NAME

PART 2 - EXECUTION

2.01 INSTALLATION

A. Interior conduit systems shall have runs less than 100 feet from point to point.

B. Provide accessible pull boxes when necessary. Provide blank covers for all outlet boxes, unless otherwise noted.

C. All bends for telephone and cable television service shall be 36 inch radius, minimum.

D. Provide outlet box in wall at 18” A.F.F. (UON) and conduit with string to above accessible ceiling location. Provide insulated bushing on end of conduits.

E. Provide twelve (12) additional outlet boxes and conduit with pull cord to above the ceiling. Final location shall be as directed by the Architect. Outlets can be added at any phase of construction with the exception of finished CMU walls.

END OF SECTION

PROJECT NAME

SECTION 26 22 13 – HIGH EFFICIENCY K-7 TRANSFORMERS (US DOE 2016)

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide dry type transformers as shown on the drawings and as hereinafter specified.

B. Copper or aluminum-wound transformers exceeding US Department of Energy 2016 mandated minimum efficiency. These transformers shall be UL listed to feed a K-7 electronic equipment load profile.

C. All transformers for job must be tested and meet energy criteria. Provide test certificate with serial number for transformer to be installed on job. Per specifications.

D. Onsite performance validation required per specifications.

E. Provide onboard datalogger option with USB plug for data retrieval when noted on Transformer Schedule.

F. 25 year warranty per specifications.

G. Basic compliance with NEMA TP1/EPACT2005, NEMA Premium, CEE Tier 1, or CSL3 is not sufficient to meet this specification due to the following:

1. Efficiencies must exceed the US DOE 2016 minimum requirement

2. No load losses must comply with those defined in this specification

3. Efficiency at low load and under nonlinear K-7 load must meet the minimum requirements of this specification

4. K-7 listing per UL 1561 is required

1.02 STANDARDS

A. US Department of Energy, 10 CFR Part 431, April 18, 2013. Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule

B. DOE Test Method for Measuring the Energy Consumption of Distribution Transformers under Appendix A to Subpart K of 10 CFR part 431.

C. Underwriters' Laboratories listed, where listing applies.

D. Designed to meet applicable requirements of American National Standards Institute (ANSI C89.1), National Electrical Manufacturer's Association (NEMA ST1-4), and Underwriters' Laboratories NEMA ST-20.

E. IEEE C57.110-1998 – IEEE Recommended Practice for establishing transformer capability when feeding nonsinusoidal load currents

F. IEEE Std C57.12.91-1995 Standard Test Code for Dry-Type Transformers

G. ISO 17025 – International Standards Organization - General requirements for the competence of testing and calibration laboratories

1.03 ACCEPTABLE MANUFACTURERS/PRODUCT

A. Basis of Design: E-Saver 2016 by Powersmiths International Corp.

B. Alternate Manufacturers: All substitutions must get approval prior to bidding per the specifications. Prior Approval is mandatory. Substitute manufacturers shall have products evaluated for acceptability and conformance with the performance requirements of this specification and shall provide detailed compliance and/or exception statements, along with the documentation required in the submittal section, including test documentation (signed by an engineer) confirming that the transformer(s) meets the specified performance. Alternate manufacturer must fill out the “Substitution Request” form found in the General electrical specification section, “Alternate Manufacturer Transformer Information Sheet” in this section, and show compliance to all parts of this specification.

C. Substitutions not following substitution requirements outlined in the General electrical section and criteria outlined in this specification in B above and 1.04 below will not be considered. When substitution information doesn’t follow specification format or is unclear, which causes additional substantial Engineer review time, review time spent may be billed to Contractor at current Engineer hourly rates.

1.04 SUBMITTALS

Submit product data including the following:

A. The shop drawings shall contain the following information:

1. KVA

2. Voltage, primary and secondary

3. Dimensions and weight

4. Sound level

5. Mounting (wall or floor)

6. Taps (FCBN and FCAN)

B. Basic Performance characteristics including insulation class, temperature rise, core and coil materials, impedances & audible noise level, unit weight

C. Short Circuit Current data: Primary & Secondary

D. Efficiency, Loss & Heat output Data

E. No load and full load losses per NEMA ST20

F. Linear load data @ 1/6, 1/4, 1/2, 3/4 & full load

G. Linear Load efficiency @ 35% loading tested per NEMA TP-2.

H. Efficiency under K7 (non-linear) load profile at 16.7%, 25%, 50%, 75%, 100% of nameplate rating.

I. 25 year Product Warranty Certificate

1.05 NONLINEAR LOAD TEST PROGRAM

A. Nonlinear Load Testing shall be carried out by an ISO 17025 Certified Efficiency Test Lab, and follow a defined protocol, independently audited within the ISO system.

B. Efficiency shall be determined purely by measurements following IEEE Std C57.12.91-1995 Standard Test Code for Dry-Type Transformers. Other methods are not acceptable.

C. The nonlinear load bank shall consist of phase-neutral equipment with a K-7 profile, representative of a mix of typical office receptacle loads.

D. Meters and CTs shall both be revenue class accurate and carry current calibration certificates. CTs shall be operated within their approved accuracy loading range. Dual meters shall gather simultaneous primary and secondary energy and harmonic data. Meter and CT details including model, accuracy, serial numbers and calibration information.

E. Efficiency: Measurements shall be taken at multiple load levels and plotted to show compliance with specification and correlation to the designed efficiency curve.

F. Harmonic data including current and Voltage THD at the different load levels shall be included with the test report.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store and protect products

B. Store in a warm, dry location with uniform temperature. Cover ventilation openings to keep out dust, water and other foreign material.

C. Handle transformers using lifting eyes and/or brackets provided for that purpose. Protect against unfavorable external environment such as rain and snow, during handling.

1.07 ON-SITE PERFORMANCE VALIDATION

A. To insure that the products shipped to the job site meet this specification, provide on-site revenue class accurate efficiency and harmonic measurements of transformers once installed and operating at customer’s site. Data shall be collected from primary and secondary sides of the transformer simultaneously on a synchronized cycle by cycle basis. The use of two discrete meters that are not synchronized is not acceptable. Sampling shall be of 10% of transformers on the project once installed and operating, as selected by customer.

1.08 PERFORMANCE VALIDATION REPORTS

A. A Performance Validation Report shall be provided for **EACH** transformer shipped on this project as follows:

1. Documentation shall be certified and signed by a (factory) professional engineer (PE), and identify each product by model and serial number.

2. Transformers shall be tested in an ISO 17025 Certified Test Lab.

3. Validation Report shall contain two components:

   a. Test Report per DOE Test Method for Measuring the Energy Consumption of Distribution Transformers under Appendix A to Subpart K of 10 CFR Part 431, identifying no load losses, and efficiency at 35% loading.

   b. Routine Test Report per NEMA ST20 including audible noise test for each unit.

PART 2 - PRODUCTS

2.01 TRANSFORMER SPECIFICATION

A. Compatibility: This product must facilitate the ability of the electrical system to supply a sinusoidal voltage in order to improve the long-term compatibility of the electrical system with all types of linear and nonlinear connected loads today and in the future. All national and international standards on harmonics and power quality set limits on levels of voltage distortion to maintain compatibility.

B. Copper or aluminum-wound, 3-phase, common core, ventilated, dry-type, isolation transformer built to UL1561, NEMA ST20 and other relevant NEMA, UL and IEEE standards; 200% rated neutral; 60Hz rated; Transformers 750 kVA and less, 600 volt primary and less, shall be UL Listed and CSA Approved. All terminals, including those for changing taps, must be readily accessible by removing a front cover plate. Windings shall be continuous with terminations brazed or welded. 10kV BIL.

C. Insulation System:

   1. Shall be NOMEX-based with an Epoxy Co-polymer impregnant for lowest environmental impact, long term reliability and long life expectancy

   2. Class: 220 degrees C

   3. Impregnant Properties for low emissions during manufacturing, highest reliability and life expectancy

   4. Epoxy co-polymer

   5. VOC: less than 1.65 lbs/gal (low emissions during manufacturing)

   6. Water absorption (24hrs @25C): less than 0.05% (superior insulation, longer life)

   7. Chemical Resistance: Must have documented excellent performance rating by supplier

   8. Dielectric Strength: minimum of 3200 volts/mil dry (for superior stress, overvoltage tolerance)

   9. Dissipation Factor: max. 0.02 @25C to reduce aging of insulation, extending useful life

D. Operating Temperature Rise: 115 degree C in a 40 degree C maximum ambient

E. Noise levels:

1. 3 dB quieter than NEMA ST-20

2. Every unit to meet this noise level. Production Test every unit. Data to be available upon request.

F. UL Listed & Labeled K-Rating: K-7 or higher

G. Enclosure type: Indoor Ventilated NEMA 1, drip-proof or NEMA 3R as scheduled.

H. Rear Clearance: UL Listed for 2" clearance from the wall rather than standard 6". This capability shall be explicitly described on the nameplate of each unit.

I. Exceed minimum efficiency requirements of US Department of Energy, 10 CFR Part 431, April 18, 2013, Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule which takes effect January 1, 2016, and comply with the table of Maximum No Load Losses, efficiency requirements at 1/6 load, efficiency at 35% load per 10 CFR Part 431, and efficiency at 25% load under a K-7 load profile.

kVA	No load losses (Watts)	Efficiency @ 1/6 load (%)	Efficiency @ 35% load (%)	Efficiency at 25% load under K-7 nonlinear load
15	47	97.85%	98.28	98.00%
30	71	98.27%	98.50	98.30%
45	97	98.40%	98.66	98.40%
75	135	98.63%	98.82	98.60%
112.5	195	98.70%	98.92	98.70%
150	235	98.80%	98.99	98.80%
225	330	98.90%	99.09	98.90%
300	400	98.95%	99.15	99.00%

J. Voltage Taps: For transformers 15kVA-750kVA, provide two 2-1/2% full capacity taps above and four 2-1/2% taps below nominal primary voltage.

K. Impedance: Between 3.0% and 6.0% unless otherwise noted.

L. TRANSFORMER OPTIONS TO BE SUPPLIED

1. Lockable Hinged Doors

a. Provide lockable hinged doors on the transformer to facilitate access and reduce arc flash risk.

b. Enclosure Options: NEMA 3R, indoor sprinklerproof, outdoor padmount, outdoor secure space, outdoor public space, totally enclosed, stainless steel.

c. Integrated long term Power & Energy Logger (if noted on schedule)

1) Supports NFPA 70E/CSA-Z462 Arc Flash Standard to provide operating data without opening transformer enclosure.

2) Basis of design: Equivalent or superior to Powersmiths Express Logger.

3) Meter shall be factory-installed inside the transformer, connected to the transformer secondary, complete with fused voltage connections, revenue class 0.5 or better CTs.

4) Access for meter setup, real time data viewing, event log, and downloading of logged data is via an integrated USB access port on the enclosure of the transformer.

5) Parameters measured include: V, I, PF, Hz, kW, kVA, kVAR, kWh, Ad, KWd, kVAd, kVARd, temperature, including the option to log min, max, average or instantaneous values of any of the parameters.

d. The meter shall log real-time data at user selected intervals, as well as an event log when measured values have exceeded user defined thresholds.

e. The logger shall be able to store a year of monthly peak demands.

f. The logger shall be able to log up any 2 selected data points for over 10 years, more data points for shorter period.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Follow all national, state and local codes with respect to transformer installation.

B. Check for damage and loose connections.

C. Set the transformer plumb and rigid.

D. Mount transformer on vibration isolation pads suitable for isolating the transformer.

E. Coordinate all work in this Section with that in other sections.

F. Upon completion of the installation, an infrared scan shall be provided for all bolted connections. Correct any deficiencies. Repeat thermal scan 3 months after installation and prepare a report for the customer.

G. Adjust transformer secondary voltages to provide the required voltage at the loads.

H. PERFORMANCE VALIDATION: To insure that the products shipped to the job site meet this specification, provide on-site revenue class accurate efficiency and harmonic measurements of transformers once installed and operating at customer's site. Data shall be collected from primary and secondary sides of the transformer simultaneously on a synchronized cycle by cycle basis. The use of two discrete meters that are not synchronized is not acceptable. Sampling shall be of 10% of transformers on the project once installed and operating, as selected by customer. Submit a detailed report to the project engineer.

I. Identify non-compliant products to the engineer and replace at no cost to the customer.

J. Provide 36" long (maximum), liquid-tight (for outdoor or wet locations) or Greenfield (for indoor or dry locations) conduit connections to the transformers. Provide cut sections of Korfund "Elasti-rib" for all contact areas between wall and floor and mount in such a manner as to reduce sound transmission. All transformers, suspended from structure shall utilize spring isolators and pad isolators to minimize vibration transfer to the structure.

K. Any transformer causing objectionable sound will be required to be replaced.

L. Set taps under load conditions for correct voltage.

M. Mount all transformers plumb and rigid.

N. Ground and bond as separately derived outputs per NEC.

O. Floor Mounting

1. Install a 3 1/2 inch high concrete pad (reference division 3). Maintain a minimum of 6 inches free air space between the enclosure and the building finishes.

2. Install 1" thick high resiliency pads to isolate the transformer from the floor using Korfund "Elastorib" or equivalent products.

P. Wall Mounting

1. Securely anchor, with minimum 1/2" diameter hardware, a wall mounting bracket to wall to provide adequate support.

2. Anchor the transformer securely to the wall bracket with minimum 1/2" diameter bolts.

Q. Suspension Mounting

1. Suspend from the structure by means of trapeze hangers constructed of galvanized all-thread rods and metal framing channels. Make double-nut connections between rods and channels.

2. Install 1" thick high resiliency pads to isolate the transformer from the trapeze hanger using Korfund "Elastorib" or equivalent products.

R. Roof Mount – Reference 'Thy Curb Detail' on plans.

PROJECT NAME

Alternate Manufacturer

Transformer Information Sheet: PROJECT NAME

(Manufacturer to fill out entire form)

Transformers must be minimum K-7.

1. Transformer Manufacturer Name: _____

2. Model Numbers:

   30 KVA Model No. _____ 112.5 KVA Model No. _____

   45 KVA Model No. _____ 150 KVA Model No. _____

   75 KVA Model No. _____ 225 KVA Model No. _____

3. K-Rating (check rating)

   _____K7 _____K9 _____K13

4. NEMA 3R: _____ Yes _____ No

5. Efficiency:

   a. Transformer meets minimum DOE 2016 efficiency _____ Yes _____ No

   b. Transformer exceeds minimum DOE 2016 efficiency _____ Yes _____ No

      Attached Load Profile efficiency data _____ Yes _____ No

   c. Is transformer designed to handle non-linear loads _____ Yes _____ No

      Attached non-linear Load Profile efficiency data _____ Yes _____ No

   d. Is actual transformer delivered to site tested per NEMA TP-2 and non-linear load efficiencies _____ Yes _____ No

6. Warrranty Period

   a. Standard Warranty _____ years

   b. Life Expectancy _____ years

7. Accessories

   a. Lockable Hinged Access Door _____ Yes _____ No

   b. Integral Secondary Breaker _____ Yes _____ No

   c. Data Logger / Meter _____ Yes _____ No

   d. Rotatable IR Port _____ Yes _____ No

END OF SECTION

PROJECT NAME

SECTION 26 24 16 - BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide branch circuit panelboards as shown on the Drawings and as herein specified.

B. Panelboard feeders are sized from the “Panelboard Connection Schedule”. When a panel is fed from a transformer use the “Transformer Connection Schedule” for feeder size. When there is a conflict between the sizes, use the largest of the two.

C. This section specifies the furnishing and installation of molded case, thermal-magnetic circuit breakers. Electronic, solid-state trip circuit breakers are NOT allowed.

D. Maximum circuits per panelboard section shall be 42 circuits.

1.02 STANDARDS

A. Provide U.L. label.

B. Comply with applicable standards of NEMA and the NEC.

1.03 ACCEPTABLE MANUFACTURERS

A. Square D/Schneider Electric

B. ITE Siemens

C. Cutler Hammer/Westinghouse/Eaton

D. General Electric

1.04 SUBMITTALS

A. Furnish Engineer shop submittal for each branch circuit panelboard.

B. Submit shop drawings for each panelboard which include outline and support points, dimensions, voltage, main bus ampacity, short circuit ampere interrupting rating, circuit breaker arrangement, sizes and number of poles. Shop drawing shall list all spaces and circuit breakers to be installed in each panelboard.

C. Provide shop submittal which includes the following:

1. Cabinet

a. Housing

b. Trim

c. Outline dimensions

d. Available spaces

e. Panelboard mounting

2. Circuit breakers

   a. Frame size

   b. Trip setting

   c. Class

   d. Interrupting rating in RMS Symmetrical amperes

   e. Mounting

   f. Voltage rating

3. Busing

   a. Ampere rating

   b. Material

   c. Incoming cable lug size

   d. Bus bracing

4. Manufacturer's catalog numbers.

5. Other descriptive data as may be required.

D. Circuit breaker arrangement must be identical to the schedules or one line diagram, unless there is a technical reason for deviation. All reasons for deviation must be stated on the shop drawings.

E. Unless specifically noted, only Max 42 circuits per section will be allowed.

PART 2 - PRODUCTS

2.01 GENERAL.

A. All new panelboards and switchboards on this project shall be by the same manufacturer. The manufacturer shall be the same as the manufacturer of the circuit breakers.

B. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trims shall have pre-formed covers for unused mounting space.

C. Interior leveling provisions shall be provided for flush mounted applications.

D. Panelboards shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.

F. Furnish suitable lugs for each conductor requiring a connection.

2.02 BUS CONSTRUCTION

A. Fabricate all buses of 98 percent IACS conductivity, copper. Size buses to limit their temperature rise within the panelboard to 65°C based on a 40°C ambient temperature.

B. Provide one continuous, un-reduced in size, bus bar per phase with “distributed phase” or “phase sequence” type connections to the branch circuit breakers. Extend the buses the height of the panelboard.

C. Provide circuit breaker connections to the bus by means of a bolt. Square D “I-Line” may be provided.

D. Insulate each individual phase bus to withstand 2000 volts a-c for 1 minute.

E. Support the bus systems using non-carbonizing, non-tracking insulators.

F. Furnish fully equipped spaces, include all appropriate connectors or mounting hardware.

G. Furnish an insulated neutral bus which is the same size as the phase buses. Larger sizes may be required by the schedules or one line diagram.

H. Furnish a solidly bonded equipment ground bus. Include terminals for feeder and branch circuit grounding conductors.

I. Furnish an isolated ground bus, with terminals, where scheduled or noted on the drawings.

J. Provide full size or larger insulated neutral bus bar. Where specified on the panel schedule, provide 200% rated neutral bus bar. Coordinate with plans.

2.03 RATINGS

A. Panelboards and circuit breakers shall be rated for 60 hertz and have a voltage and current rating as indicated on the drawings or schedules.

B. The finished panelboard assembly shall be fully rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault currents indicated on the drawings or schedules. The minimum rating for a 240 volt a-c panelboard shall be rated 10,000 AIC RMS symmetrical and a 480 volt a-c panelboard shall be rated 14,000 AIC RMS symmetrical minimum. Series ratings are not permitted.

C. Final AIC ratings for all panels shall be determined and provided by the gear manufacturer to meet minimum allowable fault current from utility company transformer. Provide coordination study, arc flash analysis, and fault current analysis as required for justification of sizes. Make all changes required by coordination and arc flash study and include in bid price. Coordination study must be completed prior to submitting gear.

2.04 ENCLOSURES

A. Enclosures shall be at least 20 inches wide and made from galvanized steel with welded interior mounting studs. Provide gutter space in accordance with the National Electrical Code. Where conductors are carried through a box, the box shall be sized to include the additional space. Enclosures shall be fully enclosed.

B. **ALL MULTI-SECTION PANEL ENCLOSURES SHALL BE THE SAME HEIGHT.**

2.05 HINGED FRONT COVER

A. Mounting shall be flush or surface, as indicated on associated schedules or drawings. Surface trims shall be the same height and width as the box. Flush trims shall overlap the box by 3/4 of an inch on all sides.

B. Fronts shall be of the concealed hinged type. Front shall not be removable with the door closed.

C. Doors on front shall have rounded corners; edges shall be free of burrs. Doors shall have a flat latch type lock with a catch and spring loaded stainless steel door pull. All lock assemblies shall be keyed alike. One key shall be provided with each lock.

E. Furnish a nameplate, circuit directory frame, card and a clear plastic covering on the inside of the door. All loads shall be identified as specified in Section 16075.

F. Provide factory applied Arc Flash Labels per NEC 110.16.

2.06 FINISH

A. Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray paint applied.

B. Nema 3R enclosures shall be properly cleaned, primed, and a finish coat of gray paint applied.

C. Supply one quart of finish paint for each project. Touch-up after installation.

2.07 MOLDED CASE THERMAL-MAGNETIC CIRCUIT BREAKERS

A. Furnish molded case, thermal-magnetic circuit breakers in lighting / appliance and power distribution panelboards for the specified service with the number of poles and ampere ratings indicated on the schedule or drawings. Incorporate inverse time characteristic by bi-metallic overload elements and an instantaneous characteristic by magnetic trip.

B. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.

D. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breakers shall be clearly marked ON and OFF.

E. Circuit breakers shall be factory sealed.

F. All circuit breakers shall be suitable for mounting in any position.

G. Circuit breakers shall be equipped with factory installed mechanical lugs.

H. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.

I. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true rms sensing and thermally responsive to protect circuit conductor(s) in a 40° C ambient temperature.

J. For 2-pole and 3-pole breakers, use the common-trip type so that an overload or fault on one pole will trip all poles simultaneously. Handle ties are not acceptable except where multiple single breakers are used to serve modular furniture.

K. Where indicated, provide ground fault (GFCB) or shunt trip breakers.

2.08 LISTING

A. The completed panelboard shall be UL listed.

B. Certification standards, with applicable voltage systems and corresponding interrupting ratings, shall be clearly marked on the face of each circuit breaker.

C. Circuit breakers shall be equipped with listed electrical accessories as noted on the schedules or drawing.

D. When required, circuit breakers shall be listed as HACR type.

E. When required, circuit breakers shall be listed as Switch Duty type.

F. When required or indicated on the drawings or schedules, equipment shall be listed for the environment in which it is installed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install box, trim and interior rigid and plumb. Center interior with opening.

B. Install panelboards in accordance with the instructions of the manufacturer and as shown on the Drawing. Install complete with all required electrical connections.

C. Unless otherwise noted, install panelboards with the top of the trim 6 ft. 0 in. above finished floor.

D. Field check panelboard loading and reconnect circuits as required to provide balanced phase and line loads.

E. Neatly bundle, route and support cables installed in wiring gutters of panelboards. Minimum bending radii as recommended by the wire and cable manufacturer.

F. Install five (5) 3/4” conduits from top of flush mounted panelboards to accessible void above ceiling. Cap end of conduits above ceiling.

G. All recessed panels are to be installed in 6” minimum wall thickness. Coordinate clear dimensions with Architect and General Contractor prior to rough-in.

H. Provide wood trim for any semi-recessed panels, including panelboards. Coordinate with General Contractor and verify finishes with the Owner/Architect.

I. Install filler blanks for any unused breaker space.

J. All panel interior to be free of debris and dirt prior to installing panel covers.

K. Check bolted and circuit breaker connections using a torque wrench.

L. The faces of all circuit breakers shall be flush with each other.

M. Affix permanent and individual circuit numbers to each circuit breaker in a uniform position.

END OF SECTION

PROJECT NAME

SECTION 26 27 26 - DEVICES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide switches and receptacles as shown on the drawings and as hereinafter specified.

1.02 STANDARDS

A. Provide all receptacles which conform with NEMA standards for amperage and voltage classification.

B. Provide devices U.L. listed for the application and for the type of wire used.

1.03 ACCEPTABLE MANUFACTURERS

A. Leviton, or approved equal

1.04 SUBMITTALS

A. Furnish Engineer shop submittal for each device.

B. Provide shop submittals which include the following information:

1. Manufacturer and catalog number.

2. NEMA configuration.

3. Voltage and amperage ratings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Straight Blade Receptacles: Furnish Leviton receptacles or approved equal, color shall be White. (Devices and coverplates connected to emergency circuits shall be red).

1. Single receptacle, 20 amp, 125-volt, 2-pole, 3-wire, grounding, NEMA 5-20R.

2. Single receptacle, 20 amp, 250-volt, 2-pole, 3-wire, grounding, NEMA 6-20R.

3. Duplex receptacle, 20 amp, 125-volt, 2-pole, 3-wire, grounding, NEMA 5-20R.

4. Tamper resistant, duplex receptacle, 20 amp, 125-volt, 2-pole, 3-wire, grounding, NEMA 5-20R.

B. Toggle Switches: Furnish Leviton switches or approved equal, color shall be White. (Devices and coverplates connected to emergency circuits shall be red).

1. Single pole, single throw, 20 amp, 120/277 volt.

2. Single pole, double throw, momentary, 20 amp, 120/277 volt.

3. Single pole, double throw, maintained, 20 amp, 120/277 volt.

4. Double pole, single throw, 20 amp, 120/277 volt.

5. Three way, single throw, 20 amp, 120/277 volt.

6. Four way, single throw, 20 amp, 120/277 volt.

C. Locking Switches: Furnish Leviton switches with #55500 key, color shall be White. (Devices and coverplates connected to emergency circuits shall be red).

1. Single pole, single throw, 20 amp, 120/277 volt.

2. Single pole, double throw, momentary, 20 amp, 120/277 volt.

3. Single pole, double throw, maintained, 20 amp, 120/277 volt.

4. Double pole, single throw, 20 amp, 120/277 volt.

5. Three way, single throw, 20 amp, 120/277 volt.

6. Four way, single throw, 20 amp, 120/277 volt.

C. Locking Switches: All key operated switches shall be Hubbell, HBL 122-RKL. **NO EXCEPTIONS TAKEN.** All switches to be 120/277 Volt, 20 Amp.

D. NLight Lighting Control Devices: Provide white devices as standard. **(Devices on emergency circuits to have red plates and white devices).**

E. Dimmer Switches: Furnish Lutron NT series, or equivalent, continuously adjustable slide dimmer with preset on/off switch. Dimmer shall be solid-state type for use with 120-volt incandescent lamps and shall have electromagnetic filters to eliminate noise, RF and TV interference. Dimmer wattage is indicated on the drawings or 1000 watt minimum.

F. Ground Fault Devices: Color shall be White. (Devices and coverplates connected to emergency circuits shall be red).

1. Ground fault circuit interrupter (GFCI), 20 amp, 125-volt, 2-pole, 3-wire, grounding, NEMA 5-20R.

2. Ground fault feed through switch, 20 amp, 125-volt.

G. Device Plates:

1. Unless otherwise indicated, provide smooth metal device plates of Type 430 stainless steel for all indoor devices. Verify color with architect prior to ordering. Cover plates for devices served by emergency circuits shall be red.

2. Provide telephone and data outlets with blank metal type 430 stainless steel covers.

3. Provide properly gasketed vertical single lift device plate of aluminum die cast for weatherproof receptacles and/or switches.

H. Floor Outlets:

1. Provide where shown on the drawings, PVC rectangular floor boxes. Coordinate all dimensions for floor boxes with Architect. Contractor shall not scale from drawings.

2. Receptacle floor outlets specified as duplex shall have duplex screw cap coverplates. Telephone and/or data floor outlet boxes to have combination screw cap coverplate.

3. Provide brass carpet flanges for each floor box installed in carpeted areas.

4. Multiple device locations shall incorporate two (2) or three (3) gang outlet box.

I. Provide GFI receptacles within 6 feet of any sink, lavatory, wet area and outdoors. All GFI resets to be located in the same room protected.

J. Provide GFI protection for all receptacles in areas where power hand tools or portable lights are used (shop areas, garages, etc.).

K. Provide GFI protection for all circuits used for heat tracing.

L. Provide a receptacle in all mechanical/electrical rooms.

M. Surge Arresting Receptacles: Where surge arresting receptacles are indicated, provide receptacles meeting Federal Specification WC-596F which are UL listed (UL 1449 and UL 498) with integral surge suppression. Provide with audible surge protection failure alarm and replaceable surge arrester module. Eagle Electric “Super Spec SurgeBloc” or acceptable equal.

N. All 120volt/20amp receptacles in kitchen area to be GFCI protected.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wiring devices of the type as indicated on drawings. Make up all connections tight and set device plumb. Use care in installing device in order to prevent damage to the device and the wire in the outlet box.

B. Device Plates: Provide a device plate for each outlet to suit the device installed and install blank plates or covers for junction boxes and empty outlets, including telephone, computer, etc.

C. Mount duplex receptacles vertically with grounding opening **up** unless otherwise noted.

D. Prior to installation of outlets other than 20A, 120 Volts, verify receptacle type with Owner through Architect. Receptacles not verified shall be changed at Electrical Contractor’s expense if necessary to operate equipment.

E. Install all switches that are required to be handicap accessible at proper height per latest ADA Standards.

F. Install wall switches vertically in an outlet box on the strike side of the door as finally hung.

G. Install single throw switches so up is the ON position.

H. Locking switches shall be furnished in corridors, common areas and any area with HID lighting. Contractor shall confirm exact location of all locking switches with the Architect/Engineer prior to rough-in.

I. Provide “Caddy Screw Gun Bracket” between wall studs, as required to install switches, thermostats, intercom devices, etc. Verify exact location of devices prior to rough-in. Device boxes shall be aligned on center line of each box.

J. Receptacles installed for electric water coolers shall be mounted at a height so as not to be visible after installation of EWC. Coordinate with equipment being provided.

K. Provide one (1) duplex GFI/weatherproof receptacle within 25 feet of all mechanical equipment, located on the roof, on mezzanines, or on the ground. Connect receptacles to nearest available circuit with not more than 6 receptacles or home run to the nearest available panelboard and provide breaker as required.

L. Engrave coverplates, designated for engraving, with 1/8 inch-high contrasting lettering.

M. Engrave the coverplates of wall switches that control equipment which is not in sight of the switch with the designation of the equipment being controlled. Lettering shall be 1/8 inch high and of a contrasting color.

N. All receptacles located above counter tops with sinks and receptacles in kitchens shall be GFI Type.

O. All receptacles used in Pre-K, Kindergarten and First Grade Classrooms must be safety type receptacles.

P. Provide eighteen (18) additional receptacles in base bid including wire, conduit, breakers and appurtenances. Each receptacle represents a dedicated circuit. Estimate length of circuit is 150 feet. Final location as directed by Architect.

Q. Provide six (6) additional lighting control stations including wire and conduit. Estimated length to circuit is 75 feet. Final location is directed by architect.

R. Provide six (6) additional motion sensors including wire and conduit. Estimated length to circuit is 75 feet. Final location is directed by architect.

S. Provide six (6) additional photo cells including wire and conduit. Estimated length to circuit is 75 feet. Final location is directed by architect.

T. Provide unit price to add additional receptacles over base bid. Use same lengths indicated above.

END OF SECTION

PROJECT NAME

SECTION 26 28 15 - SAFETY DISCONNECT SWITCH

PART 1 - GENERAL

1.01 SCOPE OR WORK

A. Provide safety switches for all pieces of equipment per NEC as indicated on the Drawings and specifications or as required.

B. All safety switches are to be FUSED unless noted otherwise.

1.02 STANDARDS

A. Conform to U.L. listed and the latest NEMA standards.

1.03 ACCEPTABLE MANUFACTURERS

A. Square D

B. ITE Siemens

C. Cutler Hammer/Westinghouse

D. General Electric

1.04 SUBMITTALS

A. Furnish Engineer shop submittal for safety disconnect switches.

B. Provide shop submittals which include the following information:

1. NEMA type

2. Enclosure type

3. Ampere rating

PART 2 - PRODUCTS

2.01 CONSTRUCTION

A. Provide safety switches appropriately rated for use with electrical system 600 Vac for 480 volts, 250 Vac for 208 volts and etc.

B. Provide safety switches NEMA Standard KS1 for type HD (heavy duty), and horsepower rated for A/C motors.

C. Switches requiring fuses and rated 600 amps and below shall be provided with rejection clips. Switches rated larger than 600 amps shall have Class “L” fuse connections provided.

D. Provide safety switches in NEMA 1 enclosure located on the interior dry locations. Provide safety switches in NEMA 3R enclosure located on the exterior of the building or in wet locations.

E. Provide quick-make and quick-break operating handle. Provide mechanisms which are an integral part of the box. Furnish a handle suitable for padlocking in the ON and OFF positions with a padlock of 5/16-inch diameter shank.

F. Door Interlock. Furnish a door interlock to prevent opening the door when the switch is in the ON position, unless bypassed, and to prevent turning the switch ON when the door is open.

G. Bypass Interlock. Furnish an external means to bypass the door interlock.

H. Terminal Shield. Furnish incoming line terminals with an insulated shield so that live parts are not exposed when the door is open.

I. Neutral. Where neutrals are indicated furnish switches with an isolated, fully rated neutral block. Make provisions for bonding the block to switch enclosure.

J. Equipment Grounding. Furnish an equipment grounding kit.

K. Fuse Holders. Where fusible switches are indicated, furnish switches with rejection-type fuse holders and fuses conforming to Section 16490, Fuses - 600 Volt and Below.

L. Auxiliary Contacts. Where switches are shown for elevator service, furnish switches with two DPST auxiliary contacts.

M. Provide lugs U.L. listed for copper cable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Securely mount safety switches in accordance with the N.E.C. Provide all mounting materials and mount safety switches vertically.

B. In general, safety switches must be mounted on an independent and separate support system, not on the equipment being served. Where such an independent support would require penetrating or resting on a roof, it is preferable to mount on the equipment. In no case, however, may the switch interfere with access to or operation of the equipment, nor shall the switch be located within the significant impact zone of a flue or other high temperature component. Where screen walls are provided for outdoor units; the top of disconnect shall be below or equal to the top of screen wall.

C. Coordinate final location of disconnect switches to provide a minimum of 36” clear in front of switch. Conduit may not be routed in access clear directly in front of disconnect switch.

D. Install switches for all equipment that requires them. Mount so that operating handle is approximately 60 inches above finished floor. Where grouped, align tops of switches.

E. Disconnects mounted above ceiling must be mounted to be readily accessible near unit. Handle to be no more than 36” above ceiling grid.

F. All exterior disconnects to be mounted below line of sight of a screen wall or if single disconnects, level with top of condenser. Verify location with Architect/Engineer prior to rough-in.

END OF SECTION

PROJECT NAME

SECTION 26 28 16 - FUSES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide and install fuses as shown on the Drawings and as hereinafter specified.

1.02 STANDARDS

A. Conform with the latest requirements of the National Electrical Code, NEMA and be UL listed.

1.03 ACCEPTABLE MANUFACTURERS

A. Bussman

B. Gould

C. Little Fuse

PART 2 - PRODUCTS

2.01 MATERIALS

A. Time Delay/Dual Element (Class R) fuses 1/10 through 600 amps.

B. Time Delay/Dual Element (Class RK5) fuses 1/10 through 200 amps for mechanical equipment and where noted.

C. Time Delay (Class L) fuses 601 - 6000 amps.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Fuses shall not be installed until equipment is ready to be energized.

B. Test and inspection shall be made prior to energization of the equipment. This shall include a thorough cleaning, tightening and review of all electrical connections and inspection of all grounding conductors.

C. All fuses shall be furnished and installed by the Electrical Contractor.

D. All fuses shall be of the same manufacturer.

E. Equipment Fuses: Verify final fuse size with actual equipment being installed. Do not exceed permitted fuse size and voltage of manufacturer ratings.

PROJECT NAME

3.02 INSTALLATION

A. Mains, Feeders and Branch Circuits:

1. Circuit 0 to 600 amperes shall be protected by current limiting dual-element, time delay fuses. All dual-element fuses shall have separate overload and short-circuit elements. The fuse must hold 500% of rated current for a minimum of ten (10) seconds, with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class RK-1 (or RK-5 where specifically permitted). They shall be marked with the proper fuse rating, per the specifications, and placed in a conspicuous location on the enclosure.

2. Circuits 601 to 6000 amperes shall be protected by current limiting time delay fuses. Fuse link shall be pure silver links (99.9%) pure), to limit the short circuit current let through valves to low levels and comply with NEC Sections requiring component protection. Fuses shall be time-delay and must hold 500% of rated current for a minimum of four (4) seconds with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class L. “CAUTION” labels to alert the end user of engineered level of protection of the electrical equipment, shall be field installed by the Electrical Contractor. They shall be marked with the proper fuse rating, per the specifications, and placed in a conspicuous location on the enclosure.

3. Motor Circuits - All individual motors rated for 200 horsepower or less shall be protected by time delay/dual-element fuses. The fuses for motors shall be installed in ratings approximately 125% of motor full load current, except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to a full speed quickly, such as large fans. Motors shall be protected by fuses of the rating shown on the Drawings. The fuses shall be UL Class RK-1 (or RK-5 where specifically permitted) Dual Element/Time Delay. “CAUTION” labels to alert the end user of the engineered level of protection of the electrical equipment shall be field installed by the Electrical Contractor. They shall be marked with the proper fuse rating, per the specifications, and placed in a conspicuous location on the enclosure.

B. Spares:

1. Upon completion of the building, the Contractor shall provide the Owner with spare fuses in cabinet as identified in Specification Section 26 05 00.

END OF SECTION

PROJECT NAME

SECTION 26 28 25 - CONTACTORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide lighting contactors as shown on the drawings and as hereinafter specified.

1.02 STANDARDS

A. Approved per UL 508 and designed in accordance with NFPA 1C52-211B.

B. UL listed.

C. Conform to the latest NEMA Standards.

1.03 ACCEPTABLE MANUFACTURERS

A. Square D

B. ITE Siemens

C. Cutler Hammer/Westinghouse

D. General Electric

1.04 SUBMITTALS

A. Furnish Engineer shop submittals for contactors.

B. Provide shop submittal which includes the following information:

1. Voltage and ampere rating

2. Wiring diagram

3. Enclosure type

4. Coil voltage

PART 2 - PRODUCTS

2.01 GENERAL

A. Continuously current rated.

B. Capable of making and breaking all cases of loads without the aid of auxiliary arcing contacts. Auxiliary arcing contacts are not acceptable.

C. Industrial duty rated for applications to 600 volts maximum.

PROJECT NAME

2.02 MATERIALS

A. Totally closed, double break, silver to silver power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.

B. Provide terminals with straight through wiring and accept copper wire.

C. Provide switches or provisions for switches as indicated on the drawings.

D. Unless otherwise indicated, provide contactor in NEMA Type 1 enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Securely mount lighting contactor. Provide all mounting hardware.

END OF SECTION

PROJECT NAME

SECTION 26 43 00 - SURGE PROTECTIVE DEVICES (SPDs)

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide a complete grounding system in strict accordance with Article 250 of the National Electrical Code and as hereinafter specified and shown on the Drawings.

PART 2 - PRODUCTS

2.01 SURGE PROTECTIVE DEVICES (SPDs)

A. SPD shall be UL 1449 labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

B. SPD shall be UL 1449 labeled as Type 1 intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

C. SPD shall be UL 1449 labeled with 20kA I-nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

D. Standard 7 Mode Protection paths: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.

E. True 10 Mode Protection paths: SPD shall provide “directly connected protection elements” between all possible modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.

F. Maintenance: Provide SPDs with a serviceable replaceable module, with indicator lights for normal and faulted conditions. Provide audible alarm and visual status indicators to indicate need for renewal or replacement. Provide units which are UL listed for installation in accessible areas.

G. Disconnecting Means: If a dedicated breaker for the SPD is not provided in the switchboard, the service entrance SPD shall include an integral UL Recognized disconnect switch. A dedicated breaker shall serve as a means of disconnect for distribution SPD’s.

H. The following styles are defined for determining ratings, installation method, and applications.

1. Service Entrance - SPD shall be exterior to panelboard enclosure, enclosure suitable for same environment as panelboard enclosure, connected to buss through instrument power type of disconnect and protection. Meet UL 1449 4th edition performance parameters. SPD shall be Type 1.

2. Distribution / Branch Panels - SPD shall be exterior to panelboard enclosure, enclosure suitable for same environment as panelboard enclosure, connected through branch circuit breaker in panelboard. Meet UL 1449 4th edition performance parameters. SPD shall be Type 1.

I. Voltage Protection Ratings : For the applicable voltage configuration the SPDs UL 1449 4th edtion Voltage Protection Rating (VPR) in any mode (L-N, L-G, and N_G), shall not exceed the following:

Voltage Configuration	UL 1449 4th Edtion VPR Standard or 10-Mode
120 Volt, 1 Phase	700
120/240 Volt, 1 Phase	700
120/208 Volt, 3 Phase Wye	700
240 Volt, 1 Phase	1000
240 Volt, 3 Phase Delta	1000
277/480 Volt, 3 Phase Wye	1000
480 Volt, 3 Phase Delta	1800

J. SPD shall meet or exceed the following criteria:

1. Surge current rating shall be as defined on the plans.

2. Life Cycle Performance Test: SPD shall be tested and pass a minimum of 17,000 repetitive surge current hits per IEEE C62.41.2 C3 combination waveform with no more than 10% degradation.

3. 471SEL Selection Requirement: When the #471SEL SPD unit is selected, the following over voltage protection requirements must be met.

- SPD shall be able to prevent common temporary over voltages from damaging the MOVs, increasing longevity and ability of SPD unit to protect the critical load. SPD shall limit the voltage per the following chart:

Overvoltage seen by MOVs as % of Nominal				
	available current			
time	30A	100A	500A	1000A
1 cycle	120%	130%	150%	160%
10 cycles	130%	150%	160%	160%
30 cycles	140%	150%	160%	160%

- Temporary Over Voltages: SPD shall be able to withstand a minimum of 100 temporary over voltage events, as defined by: 30A available fault current, 30 cycles of duration, with 10 seconds between events.

K. Available Manufacturers: Subject to compliance with requirements, manufacturers offering SPDs which may be incorporated in the work included, but are not limited to the following:

1. Basis of Design: ACT Communications

2. Alt. Manufacture: All substitutions must get prior approval submit as an Alternate with 3rd party test to verify performance matches specification. Performance cannot be reduced to be considered an alternate.

3. Substitutions not following substitution requirements outlined in general electrical section and criteria outlined in this section will not be considered.

L. Warranty: Manufacturer agrees to repair or replace SPDs that have been started up and inspected per 3.02.A which fail in materials or workmanship within specified warranty period.

1. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 3 - EXECUTION

3.01 INSTALLATION OF SURGE PROTECTIVE DEVICES (SPDs)

A. General: Install surge arrestors where indicated. Follow the manufacturer's instruction and NEC Article 285 for installation on line or load side of services.

B. Limit the length of tap conductors to the least length practicable. In no case extend unprotected tap conductors more than ten (10) feet, or beyond the enclosure of the panelboard, switchboard or disconnect served.

C. Upon completion of installation, provide the start-up and testing services of a factory-authorized and factory-trained local service representative. A member of the engineer's office or a representative of SWMCO, (512-277-0266), shall be required for performing and witnessing of the tests. The tests shall include:

1. Off-line Testing: Impulse injection to verify the system tolerances as well as verification of proper facility neutral-to-ground bond. Compare field test results to factory benchmark test parameters supplied with each individual unit.

2. On-line Testing: Verify that suppression and filtering paths are operating with 100% protection as well as verification of proper facility neutral-to-ground bond by measuring neutral-to-ground current and voltage and by visual inspection.

3. Voltage measurements from Line-to-Ground (L-G), Line-to-Neutral (L-N), Line-to-Line (L-L), and Neutral-to-Ground (N-G), taken at the time of the testing procedure.

3.02 DOCUMENTATION AND REPORTING

A. Record results of field testing and compare to factory benchmark test parameters supplied with each individual surge protective device. Indicate that the integrity of neutral-to-ground bonds were verified through testing and visual inspection, and that grounding bonds were observed to be in place.

B. Submit to the Owner's representative and to the Architect/Engineer copies of the startup test results and the factory benchmark testing results for confirmation of proper suppression filter system function, as required by this section. Provide the number of copies as required by Division One and the Electrical General Provisions section; and three copies where not otherwise specified.

PROJECT NAME

Surge Protection: PROJECT NAME _____

(Manufacturer to fill out entire form)

1. Surge Manufacturer Name: _____

2. Model Numbers for:
   a. "MSB":
      Model: _____
   b. Panel s _____:
      Model: _____
   b. Panel s _____:
      Model: _____

3. Does MSB Surge have Advance Monitoring _____ Yes _____ No
   (Advanced Monitoring: Voltmeter, Surge Counter, Event Logger)
   Attached specification sheet on monitor _____ Yes _____ No

4. Does MSB have Over-Voltage Protection _____ Yes _____ No

5. Surge ratings:
   a. Model _____ Rating _____
   b. Model _____ Rating _____
   c. Model _____ Rating _____

6. Testing
   a. Have units been tested for Surge Impulse Surge Current by a third party independent laboratory? _____ Yes _____ No
   b. Attached 3rd party Test Report _____ Yes _____ No
   c. Can SPD be tested in field and compared to factory test _____ Yes ___ No

7. Warranty Period
   a. Standard Warranty _____ Years
   b. Life Expectancy _____ Years

END OF SECTION

PROJECT NAME

SECTION 26 51 00 - INTERIOR LIGHTING SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all lighting fixtures and equipment as specified in the fixture schedule. Include all necessary accessories and appurtenances required for a complete and operating system whether or not specifically shown.

1.02 STANDARD

A. Provide all materials and accessories, whether specifically described or not, of the best grade of the commercial manufacturer. Provide first class workmanship in every respect.

B. Provide all lighting fixtures with Underwriters' label and manufacturer's label. Attachment of U.L. labels after delivery of fixtures is not acceptable.

C. Manufacture all lighting fixtures in accordance with the National Electrical Code.

D. Ballasts:

1. Provide ballasts for fluorescent lamps which meet U.L. specifications for Class P listing, applicable ANSI Standard Ballast Specifications, and certified by C.B.M. **Maximum - 2 lamps per ballast.**

2. Provide ballasts for HID lamps which comply with the UL Standard for High-Intensity Discharge Lamp Ballasts.

E. Provide lamps manufactured by North American Phillips or Sylvania. Unless otherwise indicated, lamp designations shown on the fixture schedule are Sylvania. (3500K)

1.03 ACCEPTABLE LIGHTING PACKAGES:

A. Lithonia

B. Thomas Daybrite

C. Hubbell

D. Others Fixtures as Scheduled or Noted

1.04 SUBMITTALS

A. Furnish Engineer shop drawings for each fixture.

B. Provide shop drawing which includes the following information:

1. Fixture type per the fixture schedule.

2. Manufacturer of the fixture.

3. Physical dimensions of the fixture.

4. Manufacturer's standard finish.

5. Fixture output distribution curves with utilization parameters.

6. Ballast temperature rating, voltage, wattage, and manufacturer.

7. Material type and thickness of lens.

8. Accessories for installation such as swivel hangers.

9. Number and type of lamps.

C. Submit point-by-point lighting calculations for areas as required by the specifications or noted on the drawings. The calculations shall include lamp lumen depreciation, luminaire dirt depreciation, ballast factor, lamp tilt factors, and initial lamp lumens. The calculations shall indicate maintained horizontal footcandle levels at a height of thirty inches above the floor. In interior spaces the maximum point spacing shall be five feet on center; for outdoor applications the maximum point spacing shall be 30 feet on center unless otherwise noted on the drawings.

D. Lighting Control Submittal
- Shop Drawing Floorplan drawings at 1/8” scale showing
    - motion sensor layout as directed on plans
    - daylight sensor layout as directed on plans
    - identify enabled fixtures
    - identify power packs
    - identify power pack location for open ceiling areas (above panel in electrical room)
- symbol legend identifying symbols
- control sequences
- riser diagrams showing low voltage cabling requirements
- cutsheets all parts

1.05 PRODUCTS STORAGE AND HANDLING

Protect fixtures delivered to the job site from the entrance of water and dust at all times. Replace fixtures damaged by improper handling or storage.

1.06 COORDINATION

A. Catalog numbers shown on the light fixture schedule may not include or adequately represent all the options and accessories required herein, this contractor shall conform to these specifications in their entirety.

B. The various ceiling types are indicated on the architectural plans and in the room finish schedules. All lighting fixtures shall be coordinated with the architectural requirements to insure that the proper trim kit, and/or mounting accessory is provided with each fixture for the intended application. All trim kits and accessories shall be provided by Contractor whether or not they are specifically indicated by the manufacturer’s catalog numbers on the lighting fixture schedule.

C. The locations of all lighting fixtures are approximate. Locations are subject to modifications at the time of installation in order to meet field conditions. Make such changes without extra charge; however, obtain approval from Engineer before any work is started which involves such modifications.

PROJECT NAME

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide all fixtures as called for in the schedules, complete with lamps.

B. Provide manufacturer's standard finish unless otherwise noted.

C. Design all recessed or semi-recessed fixtures compatible with ceilings as installed. Provide frames where required for proper installation.

D. Furnish complete, all fixtures requiring end caps, mounting spacers or other necessary items whether the catalog number shown includes such items or not.

E. Conceal all fixture parts within the fixture construction.

F. Self locking lenses/latches are not acceptable.

G. Lighting fixture construction shall effectively eliminate light leaks between the frame, lens, housing and the interior finish surface. Furnish one lens hold-down clip at two foot centers.

H. Linear fluorescent lampholders shall be turn type, medium base, bi-pin, 660 watt, 600 volt.

I. Conceal all fixture parts, including emergency components, within the fixture construction.

J. Fixture construction shall allow parts and lens to be replaced without special tooling.

K. Fixture shall be provided with disconnecting means per NEC 2008.

2.02 FLUORESCENT LIGHTING FIXTURES

A. Grid troffers (lay-ins) must conform to the following:

1. Steel housing with T-bar clips.

2. Flush steel door frame with metal rotary action latches. Door latches or hinges from either side.

3. Diffusers (lens) shall be flat, UV stabilized, acrylic, # 12 pattern a with minimum thickness of 0.095 inches.

B. Wet location troffers must conform to the following:

1. Steel housing.

2. Flush aluminum door frame with metal rotary action latches.

a. Door latches or hinges from either side.

b. Neoprene gasketing between the lens, doorframe, housing and mounting surface.

3. Diffusers (lens) shall be flat, UV stabilized, acrylic, # 12 pattern with internal prisms and a minimum thickness of 0.125 inches.

C. Surface or stem mounted fixtures with a lens must conform to the following:

1. Steel housing.

2. Flush steel door frame with metal rotary action latches.

3. Diffusers (lens) shall be flat, UV stabilized, acrylic, # 12 pattern with a minimum thickness of 0.095 inches.

D. Strip lights must conform to the following:

1. Steel, heavy duty construction.

2. 4 foot lamp lengths. Tandem, double length units are acceptable.

3. Lampholder are secured by a screwed-on end plate.

4. 4 foot wireguards. Tandem units require 2.

2.03 COMPACT FLUORESCENT LIGHTING FIXTURES

A. Compact fluorescent downlights must conform to the following:

1. Galvanized steel frame with adjustable hangers.

2. Outdoor and wet area fixtures shall be lensed, gasketed and listed for wet locations. Only lenses which are flat shall be provided.

3. Electronic ballast if available.

2.04 FLUORESCENT BALLAST

A. Ballast which are located outdoors and in un-heated indoor areas shall be rated for reliable starting to 0 degree F.

B. All fluorescent ballasts must conform to the following:

1. Thermally protected Class P with auto restart circuitry.

2. Class “A” sound rating.

3. Power factor equal to or greater than 90.

4. Contain no PCBs or asbestos.

5. Certification Ballast Manufacturers (CBM) approved.

6. Provide Quick Disconnect (QD) option for quick disconnecting of all ballasts.

C. Linear fluorescent ballast must conform to the following:

1. Fixtures with three or more lamps shall have two ballasts to accommodate dual level switching. Provide 1 or 2 lamp ballasts. Do not use 3 and 4 lamp ballasts. All ballast are to be installed within the fixture of the lamps served.

2. Electronic, instant-start and parallel-connected.

3. Enclosed in a metal enclosure.

4. Provided with integral, color coded leads.

5. Operate at a frequency of 20kHZ or greater with less than 3% visible lamp flicker.

6. Input current total harmonic distortion (THD) shall not exceed 10%.

7. Lamp current crest factor (ratio of peak to RMS current) shall be 1.7 or less.

8. Operate from a 60 Hz input source of 120 or 277 volts and sustain variations of ± 10% (Voltage & Frequency) with no damage to the ballasts.

9. Provide transient immunity.

10. Allow remaining lamp(s) to maintain full light output if one or more lamps fail.

11. Tolerate sustained open circuit and short circuit output conditions without damage.

12. Tolerate operation of up to 65 deg. C. case temperature without damage.

13. Comply with the Federal Communication Commission Rules and Regulations for electromagnetic/radio frequency interference (EMI/RFI), for non-consumer equipment (class A).

D. Compact fluorescent ballast must conform to the following:

1. Operate at a frequency of 20kHZ or greater with less than 3% visible lamp flicker.

2. Input current total harmonic distortion (THD) shall not exceed 20%.

3. Lamp current crest factor (ratio of peak to RMS current) shall be 1.7 or less.

4. Operate from a 60 Hz input source of 120 or 277 volts and sustain variations of ± 10% (Voltage & Frequency) with no damage to the ballasts.

5. Provide transient immunity.

6. Tolerate sustained open circuit and short circuit output conditions without damage.

7. Comply with the Federal Communication Commission Rules and Regulations for electromagnetic/radio frequency interference (EMI/RFI), for non-consumer equipment (class A).

2.05 FLUORESCENT POWER PACKS

A. Where indicated, furnish a system consisting of a sealed rechargeable maintenance-free nickel cadmium battery, battery charger, solid state inverter, test switch, and pilot light.

B. Fluorescent power packs must conform to the following:

1. Suitable for use in both normal and emergency operational modes.

2. Compatible with magnetic and electronic, instant start, 4 foot T8 lamps.

3. Produce 1000 to 1400 lumens initial emergency light output.

4. Operate one lamp in each fixture for a minimum of 90 minutes.

5. Steel housing, approx. 9 3/8” long, mounted concealed within the ballast channel.

6. Test switch and pilot light mounted on the ballast channel cover.

C. Label emergency lighting power packs, using a black marking pen, with the identity of the un-switched circuit.

2.06 EMERGENCY EXIT LIGHTS

A. Exit lights must conform to the following:

1. Furnish a system consisting of a sealed rechargeable maintenance-free nickel cadmium battery, battery charger, solid state inverter, test switch, and pilot light.

2. Meet or exceed the current NFPA requirements.

3. Light emitting diode (LED) type.

4. Die-cast aluminum.

5. Concealed and removable directional chevron knock-outs.

6. Stencil face.

7. Red letter color.

B. Label power packs, using a black marking pen, with the identity of the un-switched circuit.

2.07 METAL HALIDE FIXTURES

A. Metal halide downlights must conform to the following:

1. Galvanized steel frame with adjustable hangers.

2. Outdoor and wet area fixtures shall have flat tempered glass lens with gaskets.

3. Porcelain lamp socket of copper alloy with nickel plated screws, shell and center contact.

B. High and low bay light fixtures must conform to the following:

1. Die-cast aluminum housing.

2. Pendant splice box which allows the fixture housing to slide on.

3. Enclosed glass reflector for high bay

4. Enclosed acrylic reflector for low bay.

5. Porcelain, mogul lamp socket of copper alloy with nickel plated screws, shell and center contact.

6. Full wire-guard, 2 piece, to protect the lens and the reflector.

7. Safety chain.

8. Outdoor and wet area fixtures shall have gaskets.

C. Recessed squares (2 X 2, T-bar and non-T-bar mounted) must conform to the following:

1. Steel housing.

2. Earthquake clips.

3. Flush steel door frame with metal rotary action latches.

4. Flat tempered prismatic glass lens.

5. Porcelain lamp socket of copper alloy with nickel plated screws, shell and center contact.

2.08 HIGH INTENSITY DISCHARGE BALLAST

A. All metal halide ballasts must conform to the following:

1. Field replaceable without the need of special tools.

2. Core and coil, lag type, high reactance, autotransformer, high power factor ballasts for 50-150 watt ballast.

3. Core and coil, constant wattage, autotransformer, high power factor ballasts for 175-1500 watt ballast.

4. All ballast must conform with ‘Energy Independence and Security Act 2007’.

B. Library ballast shall achieve an “A” sound rating.

2.09 LAMPS

A. Incandescent lamps shall be rated at 130 volt and have medium, screw, brass bases.

B. Linear and compact fluorescent lamps shall have a color rendering index (CRI) of 80 or greater and a color temperature of 3500 Kelvins.

C. Mogul base HID lamps are preferred over medium bases.

2.10 LED LIGHT FIXTURE

A. Power supplies must use Constant Current Reduction (CCR) for dimming.

B. LED lamps shall have a color rendering index (CRI) of 80 or greater and a color temperature of 3500 Kelvins for interior fixtures and 4100 Kelvins for exterior fixtures or as specified on drawings.

C. Lamp life of minimum of 60,000 hours or as specified.

D. Fixtures must be supplied with multiple power supplies for multi-level switching when specified.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set luminaries true, free of light leaks, warps, dents or other irregularities. Provide the length of stems as required to hang all luminaries level and in the same plane. **VERIFY THE TYPE OF ALL CEILINGS BEFORE ORDERING FIXTURES, AND PROVIDE FIXTURES AND MOUNTINGS TO SUIT.** Mount all fixtures at a position and height to clear equipment, ductwork, piping, etc., in mechanical rooms, storage rooms, etc. Provide appurtenances for all light fixtures, which include stud supports, stems, mounting brackets, frames and plaster rings.

B. Support luminaries only from structural elements which are capable of carrying the total weight. Mount all lighting fixtures rigid with no rocking action. Provide 13/16" channels as needed.

C. The locations of all lighting fixtures as shown are approximate. It is understood that they are subject to such modifications as may be found necessary or desirable at the time of installation in order to meet field conditions. Make such changes without extra charge; however, obtain approval from Engineer before any work is started which involves such modifications.

D. Install ballasts and fixtures in accordance with the NEC and ANSI Standards.

E. Adjust all floodlights and spotlights to the satisfaction of the Engineer.

F. Connect all exit lighting fixtures to the nearest unswitched circuit or the nearest emergency circuit. Connect all emergency lighting fixtures to same circuit as normal area lighting in same area per NEC Article 700

G. Provide and install necessary hardware and accessories to maintain 1.5 inches clearance from combustible material on all light fixtures with ballast.

H. Provide all exit signs with required directional arrows, to indicate direction of egress travel.

I. Fixtures shall <u>NOT</u> be daisy chained together.

J. Troffer (lay-in) lighting fixtures shall be supported from the building structure by a minimum 12 gage galvanized carbon steel soft temper hanger wires. Install two hangers at diagonally opposite corners of each lay-in light fixture 2'x4' or smaller and one hanger at each corner of each lay-in light fixture larger than 2'x4'. Supporting of light fixtures from ceiling system is not acceptable.

K. Each recessed lighting fixture shall be separately connected to a junction box with a flexible wiring method (i.e. daisy chaining from fixture to fixture is not allowed). The flexible conduit from the junction box to the fixture shall not lay on the ceiling as finally installed and shall not exceed 6 feet in length.

L. Boxes to which light fixtures or pendants are mounted shall NOT contain any conductors foreign to the operation of such light or pendant application. Removal of lights, pendants and cord drops to access other branch circuits is NOT acceptable.

M. Pendant mounted light fixtures shall be provided with ¾", threaded, rigid metal conduit, painted to match the fixture color.

N. Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surface, provide gaskets as needed.

O. Install high or low bay light fixtures between the joist with the bottom of the reflector flush with the bottom cord of the joist. Engineer will direct if obstructions such as ducts, beams, etc. are permanently installed below the joist.

P. Locate mechanical, electrical, equipment, etc. room light fixtures to provide the best coverage and clear all obstructions such as ducts, piping, bracing and supports.

Q. Fluorescent High Bay are to be rigidly mounted with all thread, ¾" threaded rigid metal conduit and unistrut as required.

3.02 CLEAN UP

A. Leave all fixtures in clean condition, free of dirt and defects.

END OF SECTION

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PROJECT NAME

SECTION 26 56 00 - EXTERIOR LIGHTING SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all exterior lighting fixtures and equipment as specified in the fixture schedule. Include all necessary accessories and appurtenances required for a complete and operating system whether or not specifically shown. Exterior lights shall be circuited through lighting contactor for time clock/photocell control.

1.02 STANDARDS

A. Provide all materials and accessories, whether specifically described or not, of the best grade of commercial manufacturer. Provide first class workmanship in every respect.

B. Provide all lighting fixtures with Underwriters' label and manufacturer's label. Attachment of U.L. labels after delivery of fixtures will not be acceptable.

C. Manufacture lighting fixtures in accordance with the National Electrical Code.

D. Provide lamps manufactured by North American Phillips or Sylvania. Unless otherwise indicated, lamp designations shown on the fixture schedule are Sylvania.

1.03 ACCEPTABLE LIGHTING PACKAGES:

A. Lithonia

B. Thomas Daybrite

C. Hubbell

D. Others as scheduled or noted

1.04 SUBMITTALS

A. Furnish Engineer shop drawings for each fixture.

B. Provide shop drawing which includes the following information:

1. Fixture type per the fixture schedule

2. Manufacturer of the fixture

3. Physical dimensions of the fixture

4. Manufacturer's standard finish

5. Lamp type recommended by the manufacturer

6. Fixture output distribution curves and photometrics

7. Ballast temperature rating, voltage, wattage, and manufacturer

8. Material type of lens

C. Furnish structural engineer with approved shop drawings on pole, post and Bollard light fixtures for purpose of designing fixture base.

1.05 PRODUCT STORAGE AND HANDLING

Protect fixtures delivered to the job site from the entrance of water and dust at all times. Replace fixtures damaged by improper handling or storage.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide luminaire complete with the fixture housing, refractor, lamp, and ballast.

B. Provide type, wattage, and voltage lamp designated on Drawings.

C. Where indicated on Drawings, provide parking lot poles and floodlight poles.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Orient lighting fixtures as shown on Drawings.

B. Adjust all floodlights and spotlights to the satisfaction of the Engineer.

C. Coordinate exact location of lighting fixtures with Architect prior to rough-in.

3.02 CLEAN UP

A. Leave all fixtures and poles in clean condition, free of dirt and defects.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Documents: Provisions of General Conditions, Supplementary Conditions, and the sections included under Procurement & Contract Requirements are included as part of this section as though bound herein.

1.2 RELATED WORK

A. Section 27 40 00 – AV-Multimedia General Requirements

B. Section 27 41 50 – Multimedia Systems

1.3 DEFINITIONS

A. Documents: The complete package of Procurement and Contract Requirements, General Technology Requirements, related Division 27 sections, Drawings, schedules, and addenda that make up this Request for Bid.

B. Work: The provision of products and/or services to meet the requirements specified in these documents.

C. Owner: The party named in the Procurement and Contract Requirements as the advertising party.

D. Consultant: True North Consulting Group.

E. NIC: Not in Contract. Item will be the responsibility of others.

F. Approved or Approval: Where approval is called for, only persons with the authorized authority may grant approval. Owner reserves all rights to govern over and grant approval and will appoint authority of agents acting on their behalf.

G. OFE: Owner Furnished Equipment. Item will be provided and integrated by Owner.

H. OFCI: Owner Furnished Contractor Installed. Item will be provided by Owner and installed by Contractor.

I. OFOI: Owner Furnished Owner Installed. Item will be provided and installed by Owner.

J. As Required: Contractor shall provide the quantity of said item that is necessary. Owner and Consultant reserve the right to make the final determination of necessary quantities to provide for a complete system.

1.4 REFERENCE STANDARDS

A. Standards and other procedures referenced by this bid package are as follows:

1. ADA – Americans with Disabilities Act of 2010

2. U.S. Department of Justice 950 Pennsylvania Ave., NW

3. Civil Rights Division Disability Rights Section – NYAV Washington, DC 20530

4. AIA – American Institute of Architects
1735 New York Avenue. N.W.
Washington, DC 20006

5. ANSI – American National Standards Institute
1819 L Street, NW 6th Fl.
Washington, DC 20036

6. ASTM – American Society of Testing and Materials
100 Barr Harbor Drive
P.O. Box C700
West Conshohocken, PA 19428

7. BICSI – Building Industry Consulting Service International, Inc.
(RCDD Standards)

6. ASTM – American Society of Testing and Materials
   100 Barr Harbor Drive
   P.O. Box C700
   West Conshohocken, PA 19428

7. BICSI – Building Industry Consulting Service International, Inc.
   (RCDD Standards)
   8610 Hidden River Parkway
   Tampa, FL 33637

8. CFR – Code of Federal Regulations
   (Available from the Government Printing Office)
   732 N. Capitol Street, NW
   Washington, DC 20401

9. EIA – Electronic Industries Alliance
   2500 Wilson Blvd.

10. IACS – International Annealed Copper Standard
    CDA – Copper Development Association
    260 Madison Avenue
    New York, NY 10016

11. IEC – International Electrotechnical Commission
    3, rue de Varembé
    P.O. Box 131
    CH – 1211 Geneva 20
    Switzerland

12. IEEE – Institute of Electrical and Electronics Engineers
    3 Park Ave. 17th Fl.
    New York, NY 10016

13. ISO – International Organization for Standardization
    1, rue Varembé
    Case Postale 56
    CH-1211 Geneva 20
    Switzerland

14. ITU-T – International Telecommunication Union – Telecommunications Standardization Sector
    Places des Nations
    CH-1211 Geneva 20
    Switzerland

15. NEC – National Electrical Code
    maintained by NFPA – National Fire Protection Association
    1 Batterymarch Park
    Qunicy, MA 02169

16. NECA – National Electrical Contractors Association
    3 Bethesda Metro Center, Suite 1100
    Bethesda, MD 20814-5372

17. NEMA – National Electrical Manufactures' Association
    2101 L Street, N.W., Suite 300
    Washington, DC 20037

18. OSHA – Occupational Safety and Health Administration
    (U.S. Department of Labor, OSHA)
    200 Constitution Avenue, NW
    Washington, DC 20210

19. TIA – Telecommunications Industry Association
    2500 Wilson Blvd., Suite 300
    Arlington, VA 22201

20. UL – Underwriters' Laboratories
    333 Pfingsten Road
    Northbrook, IL 60062-2096

B. Standards: Referenced standards and/or procedures will be binding on the Contractor and work will be judged against such standards and procedures unless otherwise stated in writing.

1.5 EXAMINATION OF EXISTING CONDITIONS

A. Examination: Contractor shall examine the facility and construction documents to the extent necessary to plan for efficient installation strategies prior to the delivery of materials to the site or the commencement of work. Other documents (architectural Drawings, hardware schedules…) may be made available upon request. Failure to adequately complete the examination shall not result in change order requests.

B. Acceptance of Conditions: Commencement of work by Contractor shall indicate acceptance of existing conditions, unless a written notice of exceptions has been provided to Owner prior to commencement.

C. Observation: If Contractor observes—during preliminary examinations or subsequent work—existing violations of fire stopping, electrical wiring, grounding, or other safety- or code-related issues, Contractor shall report these to Owner in a timely manner.

1.6 DRAWING SYMBOLS

A. General: Work, equipment, or material delineated on any drawing in this package will be expected to be provided by Contractor unless noted otherwise.

B. Interpretation: Work shall be installed in accordance with the intent diagrammatically expressed on the Drawings and described in the written specifications. Contractor shall not make limiting interpretation that provides for incomplete work or a non-functioning system.

1.7 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Storage: Storage of materials shall remain the full responsibility of Contractor until Acceptance.

B. Protection: Contractor shall take all necessary precautions to protect materials from the following:

1. Theft
2. Vandalism/Tampering
3. Dents
4. Scratches
5. Dust
6. Temperature
7. Weather
8. Cutting
9. Paint
10. Other hazardous conditions

C. Replacement: Contractor shall replace any damaged or lost material as required by Owner or Consultant.

D. Installed Materials: Installed materials remain the responsibility of the Contractor until Acceptance. Contractor shall take necessary precautions to ensure the safety and security of installed materials.

1.8 CONTRACT MODIFICATION PROCEDURES

A. Changes: Changes to the contract may be initiated by Owner, Consultant or Contractor.

B. Proposal Request (PR): If a change originates with Owner or Consultant, Consultant shall issue a Proposal Request to Contract.

C. Request for Information (RFI): If a change originates with Contractor, the Contractor shall submit an RFI for Consultant review. If it is deemed a change is necessary, the Consultant shall issue a PR to address the change.

D. References: A Change Proposal shall reference the work to be performed, and shall include the cost change to the Project (if any) and the time change to the scheduled completion (if any).

E. Additional Information: Consultant may request additional information to be supplied with the Change Proposal for consideration.

F. Acceptance: Owner reserves the right to accept or reject Change Proposals.

G. Change Order: A Change order is a modification of the contract:

1. If a Change Order is approved, Owner will issue a Change Order that references PR. Change Order is not valid until it has been signed by Owner.

2. Work performed or equipment supplied outside of contract without a valid Change Order is done at Contractor's own risk.

1.9 OWNER-FURNISHED PRODUCTS

A. Delivery: Owner is responsible for delivery of Owner-furnished products to the Project site, unless otherwise specified in this document.

B. Placement: Contractor is responsible for locating, inspecting, and moving Owner-furnished products to their final installation position.

C. Inspection: Contractor shall report any damage, discrepancies in quantity, type, or function to Owner and Consultant immediately upon discovery.

D. Warranty: Contractor assumes no responsibility for any material warranty for Owner-furnished products. Contractor shall be responsible for integrating, cabling, and installing Owner-furnished products under the same warranty conditions as other products furnished by Contractor.

1.10 CONSTRUCTION PROGRESS MEETINGS

A. Attendance: Contractor is required to attend job progress meetings in accordance with requirements set by Owner or Consultant.

B. Additional Coordination: Contractor shall request additional job construction coordination meetings it deems to be necessary to ensure coordination of its responsibilities with other parties.

1.11 CONSTRUCTION PROGRESS DOCUMENTATION

A. Completion: Contractor shall complete and submit all construction progress documentation as requested by Owner and Consultant. Progress documents shall be submitted every two weeks, at minimum.

B. Failure to Complete: Failure to complete requested construction progress documentation may result in the withholding of payment by Owner.

1.12 SUBMITTAL PROCEDURES

A. Provision: Contractor shall provide submittals of any corrections or additions to Consultant prior to the procurement of equipment or commencement of work. Blue-line Drawings shall be prepared and submitted on 30" x 42" paper. Equipment lists, data sheets, etc., shall be on 8½" x 11" paper, punched and inserted in a three-ring binder.

B. Prior to Work: Submittals shall be provided to Consultant within ten (10) days after the notice to proceed. Submittals are identified in section(s) following Section 27 00 00.

C. Review: Submittals shall be received and stamped "Reviewed" by Consultant prior to the procurement of material or the commencement of work. Any procurement or work performed prior to this approval is at Contractor's own risk.

D. Project Timeline: Project timeline will not be altered due to lateness of submittals. Contractor will remain bound to deliver a timely, complete, and finished project as stipulated in their contract.

E. Failure to Provide: The failure of Contractor to provide submittals as required herein may result in the withholding of payment for work and/or the cancellation of the contract.

1.13 CLOSEOUT PROCEDURES

A. Notification: Contractor shall provide written notification to Consultant and Owner when Contractor is satisfied that the work has been completed and is ready for inspection.

B. Closeout Submittals: Contractor shall provide closeout submittals to Consultant in accordance with the requirements found in these documents. Consultant shall receive the closeout submittals no less than three (3) business days prior to the scheduled final inspection.

C. Final Inspection: Contractor is required to be present for the final inspection by Consultant.

D. Punch List: Work or materials found to be incomplete, of unsatisfactory quality, failing to meet the specifications in these documents, and/or unacceptable to Consultant or Owner shall be documented by Consultant and provided to Contractor to rectify.

E. Re-Inspection: If more than one (1) re-inspection is necessary, the costs of the additional travel, hours, and expenses of Owner and Consultant may be deducted by Owner from the contract amount due Contractor.

F. Punch List Approval: Once all punchlist items are complete, the Contractor shall return an initialed punchlist to the Consultant and Owner for verification. Punch list shall be considered complete only after having been signed by Owner and Consultant.

1.14 SOFTWARE

A. Versions: Consultant uses the following software versions:

1. Autodesk AutoCAD MEP 2013 or earlier version
2. Autodesk Revit MEP 2013
3. Microsoft Word 2010 or 2013
4. Microsoft Excel 2010 or 2013
5. Microsoft Visio 2010 or 2013

1.15 PROJECT MANAGEMENT

A. Project Manager: Contractor shall appoint a Project Manager who will be the main point of contact for Owner and Consultant regarding the Project.

B. Responsibility: Project Manager is responsible for the following:

1. Successfully completing the contract in a timely manner.
2. Overseeing work and performance of all employees and subcontractors who have been hired by Contractor and ensuring compliance with specification.
3. Completing and submitting required documentation.
4. Attending Project coordination meetings as required by Owner, Consultant, and Contractor. Contractor is responsible for taking minutes of these meetings and distributing copies to all participants.
5. Coordinating with Owner, Consultant, Architect, General Contractor, and other Contractors involved in the Project to ensure smooth flow of work and on-time Project completion.
6. Providing a written bi-weekly progress update to the Owner and Consultant.
7. Reporting all unexpected conditions and problems that may result in delay or expense to Owner and Consultant immediately upon discovery.

C. Change of Project Manager: If Contractor seeks to change Project Manager during the course of the Project, such change is subject to prior written approval from Owner.

1.16 QUALITY ASSURANCE

A. Assurance: It is the intent of these specifications to describe and provide for a complete, professional, and reliable installation.

B. Qualifications: Contractor employees who are engaged in installation shall be properly trained in the tasks they are expected to perform.

C. Acceptability: Owner shall determine the acceptability of work.

D. Regulatory Requirements: Contractor shall comply with code requirements that apply to the work being performed.

E. Certifications: Where manufacturer certifications are required for warranty or for authorized resale, installation personnel shall have received such certification prior to the start of installation of those manufacturers' materials.

1.17 QUALITY CONTROL

A. Installation: During installation period, when connections are made to the Owner's existing infrastructure, Contractor shall use care to ensure that no negative results occur that could reduce or hamper existing systems.

PART 2 – PRODUCTS

2.1 BASIC EQUIPMENT AND MATERIALS REQUIREMENTS

A. Standards: Equipment and materials used to accomplish the goals of this Project shall meet standards for good engineering practice as defined within this document.

B. Quality: Products specified in these documents are intended to establish a baseline or operational, functional, and performance-based standards that all proposed products shall meet or exceed by functionality and quality.

2.2 FACTORY-ASSEMBLED PRODUCTS

A. Manufacturer: Reference to specific equipment manufacturers does not imply that all products produced by that manufacturer meet the specification requirements.

B. Age of Equipment: Equipment shall be new and unused with full manufacturer's warranties. Contractor shall supplement such warranties as required by the specification.

C. No Modification: Where a product is available from a factory/manufacturer to meet the needs as outlined, that product shall be used without modification to ensure the full factory warranty is maintained.

D. Like Materials: Like materials used shall be of the same manufacturer, model, and quality unless otherwise specified.

E. Software/Firmware: No software or firmware is to be used unless specifically authorized by Owner or its appointed representative.

2.3 RACKS, CABINETS, HARDWARE

A. Equipment Racks and Cabinets: Provide racks and cabinets as specified herein and/or described in accompanying documents, appendices, or Drawings. Verify that any existing racks and/or cabinets provided by others are complete, bringing any discrepancies to the attention of Owner and Consultant prior to beginning the installation.

B. Shelves and Mounts: Contractor shall supply necessary mounting hardware to install rack-mounted equipment. Mounting hardware shall be a product of the manufacturer of the equipment to be mounted, or manufacturer of the rack system, or approved by either for use with their product. Provide supporting channels, shelves, rack mounts, and/or rack ears as recommended by equipment manufacturers.

C. Screws and Washers: Contractor shall provide screw head types appropriate to the level of security required for the equipment and racking. Screws shall include polyethylene or nylon washer.

1. Public Access Areas: Star post security screws shall be used for hardware and equipment mounted in equipment racks and consoles in areas that are accessible to the public.

2. Restricted Access Areas: Philips head screws shall be used where a secure room or locked rack/console door prevents public access.

2.4 CABLE AND CONNECTORS

A. Cable: Cable shall be selected and applied in a manner defined by signal type, consistent with best industry practices. Highest quality products shall be used with attention given to transmission characteristics, termination methods, resistive and complex impedance at operating frequencies, and insulating material characteristics. Where required by the NEC, substitutions of air handing plenum cable shall exactly match the normally applied product and shall meet the standards of UL Standard #900 and the NEC Articles 800 and 820.

B. Connectors: Highest quality products shall be used with attention given to transmission characteristics, termination methods, resistive and complex impedance at operating frequencies, and insulating material characteristics. Strain reliefs and cable clamps shall be sized for the connector and the cable.

C. Color: Cable and connector color shall be coordinated with Consultant and Owner to maintain consistency with cable and connector color schemes used by other trades.

2.5 CABLE MANAGEMENT

A. Velcro Cable Ties: Above or below ceiling level and within equipment enclosures, Velcro straps shall be used on all cable bundles. Velcro straps shall be black, with no logo or decoration.

B. Plastic/nylon cable ties shall not be used for voice/data or AV cables.

2.6 ANCILLARY HARDWARE

A. General: Contractor will provide ancillary and required accessory items necessary to furnish to Owner a complete and fully functional system.

B. Interpretation: Exclusion of or limitation in the language used in the Drawings or specifications shall not be interpreted as meaning that ancillary or accessory items of work or equipment necessary to complete or make the installed system fully functional can be omitted.

2.7 GROUNDING HARDWARE

A. Mechanical Connectors

1. Material: Mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers, and lock washers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.

2. Split Bolts: Split bolt connector types shall not be used.

3. Standards: Connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size, and manufacturer.

B. Compression Connectors

1. Material: Compression connectors shall be manufactured from pure wrought copper. Conductivity of this material shall be no less than 99% by IACS standards.

2. Standards: Connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

3. Installation: Installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.

4. Labeling: Connectors shall be clearly marked with manufacturer, catalog number, conductor size, and required compression tool settings.

5. Protection: Each connector shall be factory filled with an oxide-inhibiting compound.

C. Wire

1. Material: Stranded copper (aluminum not permitted). AWG #3, AWG #4 and AWG #6 as specified on Project Drawings or sections after 27 00 00.

2. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications, or as required by NFPA 70, whichever is larger. Differentiate between normal ground and isolated ground when both are used on the same facility.

2.8 COMPATIBILITY OF RELATED EQUIPMENT

A. Existing Equipment: Equipment and systems specified in these documents shall be assumed to be compatible with the systems already installed at Owner site(s) and as identified in this document as related to this Project.

B. Installed Equipment: Specified equipment and systems shall be compatible with all other equipment and systems as offered by Contractor, thus placing the responsibility on Contractor to ensure proper interaction.

2.9 MAINTENANCE MANUALS

A. Contractor shall produce a maintenance manual showing interconnection of equipment and any special procedures necessary for proper operation of the systems.

PART 3 – EXECUTION

3.1 GENERAL

A. Contractor

3.2 GENERAL

A. Contractor shall provide, furnish, deliver, transport, erect, install, configure, and connect completely all of the material and equipment described herein or depicted on any bid package document or Drawing, and shall leave all systems in first-class operating condition.

3.3 COORDINATION

A. General: Contractor shall cooperate with other Contractors for proper provisioning, anchorage, placement, and execution of all work. Interference between the work of various Contractors shall be resolved before installation. In the event of conflict with other trades on space requirements or location, refer the matter to Owner and Consultant for decision.

B. Related Work: References to the following related work do not limit or release Contractor from the responsibility of coordination with other trades or from having the necessary knowledge of other non-referenced work.

1. Work by General Contractor.

2. Work by other Technology Contractors.

3. Work by Electrical Contractor, including electrical rough-ins and surface-mounted raceway.

C. Delays: Contractor shall coordinate with all other trades to avoid causing delays in the installation schedule.

D. AC Power: Contractor shall coordinate with General Contractor its requirements for proper AC power to service all equipment installed by Contractor.

E. Grounding: Contractor shall coordinate with General Contractor its requirements for proper ground system to its equipment.

F. Surface-Mounted Raceway Coordination

1. General and Electrical Contractors: Contractor shall coordinate with General Contractor and Electrical Contractor the installation of surface-mounted-raceway where not provided but made necessary by non-penetrable wall.

2. Verification: Contractor shall field verify and coordinate the proposed use of surface-mounted raceway at any location with Consultant and Owner.

3.4 BASIC EXECUTION REQUIREMENTS

A. General: Contractor is responsible for following industry standards of good practice for telecommunications and networking equipment.

B. Aesthetic Factors: With the installation of equipment and cables, consideration shall be given not only to operation efficiency but also to overall aesthetic factors. Contractor shall redo, at no cost to Owner, any work deemed by Owner to appear sloppy, hastily done, or unprofessional. Owner shall make final decision over whether work shall be redone.

C. Manufacturers' Recommendations: Manufactured items, materials, and equipment shall be applied, installed, connected, erected, used, and adjusted as recommended by the manufacturers or as indicated in their published literature unless otherwise noted herein.

D. Protection of Work Area: Work shall be properly protected during construction, including the shielding of soft or fragile materials, protecting against dust and dirt, protecting and supporting cable ends off of the floor and from other traffic, protecting floor box lids, and temporarily plugging open conduits during construction. Upon completion, installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of work shall be removed from the premises.

E. Waste Materials: Contractor shall keep work area neat, orderly, and free from accumulation of waste materials. Remove trash and debris from the building and job site as required to maintain a clean work environment at all times. Rubbish shall be moved to a common trash point or receptacle on the job site as determined and directed by General Contractor or Owner.

F. Ceiling Grid: Contractor shall not hang cable supports from ceiling grid wire.

G. Roof Deck: Contractor shall not shoot into the roof deck for mounting cable hangers.

H. Mounting: Equipment and enclosures shall be mounted plumb and square in relation to the structure.

3.5 PREPARATION

A. Existing Equipment: Prior to any installation, the Contractor shall prepare the site by removing any remaining debris, leveling equipment racks (where appropriate), and verifying information and systems stated to be in-place are ready for use.

B. Equipment for Installation: Prior to installation, Contractor shall ensure that required major equipment has been secured and is ready for installation.

3.6 CLEANING

A. At the end of each work period or day, Contractor shall remove excess packing, drilling remnants, and other non-equipment related parts, materials, or debris to ensure a clean, safe, and professional working environment.

3.7 FIRE STOPPING

A. Contractor is responsible for applying fire-stopping material in and around all openings that it creates or are created for it, whether or not specifically indicated in specifications or Project Drawings, where code or good engineering practice suggests or requires the use of fire stopping material.

B. Contractor shall ensure that all fire-stopping materials meet appropriate codes and are applied according to good engineering practice.

3.8 WATERPROOFING

A. Contractor shall create a waterproof seal in and around any openings to the outside environment that are created by Contractor or for systems being installed.

B. Contractor shall ensure that all waterproof materials meet appropriate codes and are applied according to good engineering practice.

3.9 RACKS, CABINETS, AND HARDWARE

A. Racks and Cabinets: Contractor shall assemble and install racks and cabinets.

B. Installation Hardware: Install hardware in a secure manner. Screws shall be tightened to a torque just sufficient to secure equipment without deforming washers beyond their original diameter.

C. Considerations: Rack mount equipment shall be secured as recommended by the manufacturer with consideration to airflow, power, and in/out connections.

D. Cross Connections: Where cross connections are required between equipment, interconnections shall be installed using cable management technology to secure cables in a neat and orderly fashion, applying best industry practices.

3.10 GROUNDING

A. General: Install products in accordance with manufacturer's instructions. Mechanical connections shall be accessible for inspection and maintenance. No insulation shall be installed over mechanical ground connections. Ground connection surfaces shall be cleaned and all connections shall be made so that disconnection or removal is impossible.

3.11 CABLE

A. Cable Treatment: Cable shall be stored and handled to assure that it is not stretched, kinked, crushed, or abraded in any way. Bend radiuses shall meet manufacturer specifications and/or recommendations. Cable shall not be installed in ambient temperatures or moisture conditions above or below the rating of the manufacturer.

B. Splicing

1. Length: No splices shall be installed in any multimedia/video cable less than five hundred (500) feet in length.

2. Voice and Data Cables: No splices are allowed in any voice or data cables.

3. Cable Splices for overhead paging system shall occur only at speaker, amplifier or volume control knob locations.

C. Lengths

1. Variations: Where cables are to be of the same length, variations in the length shall be less than plus or minus ½". Lengths of cables are based on the length of the unterminated signal conductors.

2. Labeling: Cables shall be marked with a scheme approved by Consultant.

3. Grouping: Cables shall be separated into like groups according to signal or power levels.

4. Power Cables: Power cables shall be grouped to one side of the equipment rack while low-level cables shall be grouped to the other side.

5. Equipment Racks: Rack wiring and cabling shall be neatly dressed.

6. Service Loops: Cables shall have service loops as defined in sections after 27 00 00.

7. Fastening: Rack cabling shall be adequately supported with Velcro wraps and horizontal support cable managers fastened to rack frame.

8. External Wire Support: External wire and cables shall be supported at least every 5 feet from the structure or as required to maintain not more than 6" cable sag between supports and without over tensioning the cables.

9. Support Hardware: Cables shall be supported by J-hooks, cable tray, or ladder rack. Hardware shall be secured to building structure using 3/8" threaded rod supports.

10. Right Angles: Cables shall run at right angles to the structure, placed above ceiling in halls or corridors.

11. Height: Cables shall not run above red iron joist.

D. Concealment: Contractor shall make every effort to conceal wiring and other apparatus into walls, floors, and ceilings, assuming code and good engineering practice allows and suggests. Cabling systems installed in public areas shall be installed within walls, ceiling, or floors or within surface wiring pathways, as dictated by codes and good engineering practice.

E. Velcro Straps: Velcro straps shall be installed snugly without deforming cable insulation. Straps shall be spaced at uneven intervals not to exceed 8 inches.

F. Obstruction: Contractor shall notify Owner immediately if any obstruction or hazard is discovered in a pathway provided by others.

3.12 CONNECTORS

A. Preparation: Cables shall be carefully prepared and connectors installed as directed by the manufacturer. Proper stripping devices and crimping tools shall be used.

B. Terminations: Connectors shall be carefully fitted to mating devices on equipment to avoid damage to mating contacts, inserts, or bodies. Specialized terminations shall be made in a neat and secure manner suited to the service of the wire and as directed by the manufacturer. Contractor shall use manufacturer specified terminations when those specifications exist.

C. Soldering: A person skilled in that practice shall execute soldered terminations.

D. Adapters: Adapters shall be used only where the identity of the necessary type of connector is unknown at the time of installation, such as for Owner-provided equipment or in anticipation of future equipment upgrades, with Consultant's approval.

3.13 EQUIPMENT INSTALLATION

A. General: Contractor shall make system properly operational and physically secure by mounting equipment and related accessories into furniture, consoles, and racks as required. Manufacturer's guidelines for installation shall be followed. Discrepancies in installation procedure or inability to complete a given task due to a shortage of materials or malfunctioning equipment shall be reported to Consultant immediately upon discovery.

B. Equipment Placement: Contractor shall locate equipment as indicated on Drawings and as specified herein. Where such information is not provided, follow industry practices and locate operable devices at convenient positions—heat generating devices at the top and seldom-accessed equipment below. Unless otherwise specified, end user-operable devices shall be positioned within the range of front wheelchair access per ADA standards.

C. Equipment Installation: Equipment shall be installed as directed by the manufacturer using equipment manufacturer's desktop mounting frames, equipment tubs, installation hardware, and techniques. Contractor shall be responsible for moving equipment from storage and for providing necessary personnel or devices to carry and lift equipment around obstacles and into operating position.

3.14 ROUGH-IN

A. Scheduling: Contractor shall make every effort to install systems per this specification in a timely manner including rough-in of cabling and other apparatus where appropriate to stay on schedule.

B. Protection of Environment: Where cabling and/or equipment is installed prior to other trades completing their work in an area, Contractor shall take necessary precautions to cover, wrap, or otherwise protect to reduce possible damage due to plastering, painting, cleaning, or other such work.

3.15 CUTTING, DRILLING, PATCHING, AND PAINTING

A. Coordination: Contractor shall coordinate the work when any cutting or drilling is required in the performance of installing the specified systems.

B. Restoration: Contractor shall return all surfaces (including walls, floors, and ceilings) to their previous condition after any cutting.

3.16 LABELING

A. General: Rack-mounted equipment and hardware shall be labeled as required herein. Connectors, jacks, receptacles, outlets, cables, cable terminations, terminal blocks, rack mounted equipment, active slots of card frame systems, etc. shall be clearly, logically, and permanently labeled in a manner acceptable to Consultant.

B. Approval: Proposed wording and/or numbering schemes for labeling shall be provided to Consultant for review and written approval prior to procurement or installation.

C. Labels used shall be permanent and secure. Provide labeling as follows unless otherwise noted in a specific section:

1. Like Size: Labels shall be sized to match other labels used for same purpose. Similarly, provide engraved labels of like size in other locations.
2. Equipment Racks: For enclosed racks containing equipment, provide labels on each equipment rack rear door or console rear panel reading “No user serviceable parts. Refer service to qualified technician.”
3. Installer and Consultant Identification: Position at the front top center section of each equipment rack a label that states the names of system Installer and Consultant.
4. Custom Panels: Custom panel nomenclature shall be engraved, etched, or screened. Markings are to be designed to ensure consistency and clarity within and without of system. Verify markings and placements by submitting label sample layouts to Consultant for approval prior to procurement.
5. Documentation: Labeling information shall appear on the as-built drawings.

3.17 ADDITIONAL ENGINEERING SERVICES

A. General: Contractor shall secure necessary engineering services where needed to meet the needs of the installation.

B. Change Orders: Only when Contractor can show that additional engineering services are needed as a result of changes to the scope of the services being requested will Owner entertain a Change Order for these services

3.18 TESTING GENERAL

A. Supplies: Contractor shall supply testing equipment needed to verify compliance with specifications found in these documents.

B. Program: Contractor shall complete required testing prior to the inspection by Owner and Consultant.

C. Data: Test data shall be properly documented and recorded so that it is available for final inspection.

D. Quality Control: Testing may be repeated during the inspection process at the request of Owner or Consultant.

3.19 TESTING

A. Prior to energizing or testing the system, ensure the following:

1. Installation: Products are installed in a proper and safe manner per the manufacturer’s instructions.
2. Cleanliness: Products are neat, clean, and unmarred and parts securely attached. Dust, debris, solder, splatter, etc., is removed.
3. Cables and Connections: Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
4. Grounding: Electronic devices are properly grounded.
5. AC Power: Each AC power receptacle is tested with a circuit checker for proper hot, neutral, and ground connections prior to plugging in equipment.

3.20 GROUNDING

A. General: Inspect grounding and bonding system conductors and connections for tightness and proper installation. Use suitable test instrument to measure resistance to ground of system.

B. Manufacturer’s Recommendations: Perform testing in accordance with test instrument manufacturer’s recommendations using the fall-of-potential method.

C. Resistance: Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCE

A. Provisions of Section 27 00 00 and Construction Documents are included as a part of this section as though bound herein.

1.2 SCOPE SUMMARY

A. This section contains general requirements for AV/Multimedia technology provision, installation, configuration, and documentation. Requirements apply to all following sections unless specifically noted.

1.3 DEFINITIONS

A. WUXGA: Referring to Widescreen Ultra Extended Graphics Array, or a resolution of 1920x1200 pixels, or a high-density 15-pin D connector used for analog computer graphics.

B. HDMI: Referring to High-Definition Multimedia Interface, or a resolution of 1920x1080 pixels, or a high-density 19 pin D connector used for digital computer and video graphics.

C. DM, DM8G+: Referring to Crestron Digital Media or Digital Media 8G+, or a resolution of up to 1920x1200 pixels transported via proprietary send and receive HDCP compliant electronics delivering high-bandwidth video, audio and control signals. [ZZZ Delete if project does not included Crestron DM / DM8G+ systems.]

D. DX, DX-LINK: Referring to AMX DX or DX-Link, or a resolution of up to 1920x1200 pixels transported via proprietary send and receive HDCP compliant electronics delivering high-bandwidth video, audio and control signals. [ZZZ Delete if project does not included AMX DX/DX-LINK systems.]

E. HDCP: High-Bandwidth Digital Content Protection, or a security protocol designed to limit unauthorized use of protected content. Where applicable, HDCP compliant devices shall be utilized per design specifications. Use of HDCP compliant systems designed herein are the responsibility of the end user and compliance with owner's Fair Use policies.

1.4 REFERENCE STANDARDS

A. As listed in Section 27 00 00.

B. Giddings, G. H. Philip. *Audio Systems – Design and Installation*.
Focal Press, 1990.
Focal Press, Elsevier Inc.
30 Corporate Drive, Suite 400
Burlington, MA 01803
Phone: (781) 221-2212
Fax: (781) 221-1615

C. *AV Installation Handbook, Second Edition.* InfoComm International, 2009.
11242 Waples Mill Road, Ste. 200
Fairfax, VA 22030
Phone: (703) 273-7200
Fax: 703-278-8082

D. Cable Products Guide #01-03 68-554-01 (latest revision)
Extron Electronics
1025 E. Ball Road
Anaheim, CA 92805
Phone: (714) 491-1500 Toll Free: (800) 633-9876
Fax: (714) 491-1517

1.5 SUBMITTALS

A. General Information: As required by Section 27 00 00.

B. There are three types of submittals required:

1. Preconstruction Submittals, including shop drawings.
2. Progress Submittals, including progress reports, work plans, and completion schedules.
3. Closeout Submittals, including as-built drawings, equipment manuals, quick reference guides, and custom software programming/configurations.

C. Preconstruction Submittals: Exact copies of original specification drawings are not acceptable as preconstruction submittal drawings. Submittals shall show the following:

1. Block Diagrams: Interconnection diagrams, including cable identification detail, notes to installers, and specific input/output port identification.
2. Mounted Elements: Structurally mounted elements, including but not limited to monitors, projectors, and loudspeakers. This shall include both plan view of placement, as well as detail of structural mounting techniques to be used.
3. Identification: Layout and labeling/engraving of custom products, including wall plates and interconnection panels.
4. Cable: Make and model of bulk cable and connectors, cable labels and connector detail.
5. Changes: Proposed changes to block diagrams and elevations provided with the Bid documents. Required changes are detailed in Section(s) to follow.

D. Progress Submittals: Submittals shall include the following:

1. Weekly Report: Weekly written report to be submitted to Consultant via email by 5 PM each Monday, outlining progress from previous week, plans for progress in the current week, and any coordination issues that may require Consultant or Owner attention.

E. Closeout Submittals: Shall include the following:

1. Binders: A complete set of equipment manuals shall be kept and organized in 3-ring binder(s) for each room system.
2. Quick Reference: Contractor shall write a quick-reference guide covering normal system operation and basic troubleshooting procedures for each room. Guide shall be a maximum of 1 page; front and back (may include pictures/illustrations). Subject to Consultant review/approval at least 3 days prior to final submittal.
3. Serial Numbers: Contractor shall also include a list of serial numbers for all supplied components which have serial numbers and a unit price more than $99.00. These will be provided on a per-room and per-system basis.

F. As-Built Drawings: Contractor shall compile a set of as-built drawings, with all changes clearly marked in red.

G. Additional Submittals: Contractor shall supply additional submittals, as required by subsequent sections.

1.6 CORRECTION PERIOD

A. Length of Period: Contractor shall offer a one year correction period to Owner for this system. Contractor shall repair all equipment and cabling problems at no additional cost to Owner during the correction period.

B. Commencement: Correction period shall begin at date of Final Acceptance.

C. Final Acceptance: shall be defined as the date at which all contract work (save for a correction period) is complete, including punchlist completion & verification, closeout submittals, and written verification by the Owner is obtained by the Contractor that the systems have been accepted.

D. On-site Response: Contractor shall respond on-site within eight (8) business hours from the time of the initial phone contact in the event that the issue cannot be resolved over the phone.

E. Equipment on Loan: Contractor shall loan equipment for any broken, defective, or non-functional equipment that cannot be repaired and returned within one week. Contractor shall provide shipping, delivery, and integration at no additional cost to Owner. Equipment shall be comparable in size, speed, brightness, and relevant performance specifications, as determined by Owner.

F. Projection Lamps: Projection lamps are to be warranted by Contractor for a minimum of 90 days, or the rated life expectancy of the lamp, whichever comes first.

G. Damaged Equipment: Equipment that is damaged due to intentional misuse, abuse or negligence is not covered under this warranty; however, Contractor shall assist Owner in putting the system back in working order in the shortest possible timeframe while charging normal service rates for labor and equipment.

PART 2 – PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Substitutions: Contractor may propose substitutions during the bid process.

B. Substitution Approval: Consultant and Owner reserve the right to govern over and determine whether proposed substitutions are equal to the product(s) named in the specifications.

2.2 PRODUCT SPECIFICATIONS

A. Provisions: Product specifications are provided in subsequent sections to Contractor for the appropriate configuration and/or provision of accessories as well as for a guide to indicate key features for possible substitutions.

B. Substitutions for Non-specified Products: Where no product specification is provided, Contractor may use manufacturer's specification for the identified product as a guide for suggesting appropriate substitutions. Substitutions are subject to prior approval by Consultant.

C. Deviation: Products provided or installed that deviate from the products named herein in make, model, color, or other significant characteristic (i.e., non-approved substitutions) shall be removed and replaced with specified products at no additional expense to Owner.

D. Where wireless microphone systems are specified, Contractor shall determine optimal frequency range for final product selection and submit Manufacturer's recommended frequency band for Owner and Consultant approval prior to ordering equipment. Contractor shall provide congruent frequency band products where like systems are specified for interoperability of components. Where three (3) or more wireless microphones are specified within the same system, Contractor shall provide and install necessary antennae distribution for optimal performance, to be submitted for Owner and Consultant approval during pre-construction phase.

2.3 MISCELLANEOUS MATERIAL

A. Required Equipment: Contractor shall provide additional system components typically and reasonably required to make system operational even though not specifically indicated in Drawings, Appendices or Specifications including, but not limited to, cable, connectors, connecting accessories, adaptors, power supplies, power strips, rack mounting adapters and shelves, cover plates and closure panels, relays and switches, remote antenna mounts, terminal blocks, and related connector and termination hardware required by but not supplied with the equipment.

B. Blank Fill Panels: Contractor shall provide blank fill panels to cover any openings in equipment racks provided under this contract whether specified in the equipment schedules or not. Fill panels shall match finish of specified rack hardware.

C. Power Distribution Strips: Contractor shall provide power distribution strips as necessary for distributing power within equipment racks and consoles. Strips shall be UL listed, be securely mountable, and appropriate for professional installation.

2.4 CABLE

A. Cable shall be provided and installed as detailed herein. Cable installed that does not conform to these standards or that has not been given prior approval by Consultant shall be removed by Contractor and replaced at Contractor's sole expense.

B. Installed Video: Video signal coaxial cables shall have #18 solid copper center conductor, gas-injected high density Polyethylene or Fluorinated Ethylene Propylene insulation, copper braid shield of at least 95% coverage and 100% dual-sided foil and black PVC jacket unless color is otherwise noted. Cable shall be designed as a low

loss serial digital video cable. Belden 1694A, WestPenn 6350, Canare L-5CFB, Liberty 18-CMR-SD, or equal. Plenum cable, Belden 1695A, WestPenn 256350, Liberty 18-CMP-VID-COAX, or equal.

C. Flexible Video: Short video cables that are intended to be moved or adjusted on a regular, frequent basis may be constructed of a stranded bare copper center conductor RG-59/equivalent cable with >94% copper braid shield and polyethylene dielectric. Canare LV-61S, Belden 1505A, WestPenn 819, or equal. Plenum cable, Belden 1506A, WestPenn 25819, or equal.

D. High Resolution RGBHV Graphics/Video: Cable type and size shall be selected to provide a minimum of 250 MHz bandwidth (-3dB) at over the length of each RGBHV signal path from source to display, including losses and gains through cable loss, signal processing, switching and distribution equipment. Manufacturer shall designate cable as suitable for high-resolution use. Extron MHR-5, Liberty RGB5C-CM or equal. Plenum cable, Extron MHR-5P, Liberty RGB5C-25-CMP, or equal.

E. Installed Line Level and Microphone (single line): Audio signal cable shall have twisted pair #22 stranded tinned copper conductors, polyethylene conductor insulation, aluminum-polyester foil shield, #24 stranded tinned copper drain wire and chrome PVC jacket. Belden 8761, West Penn 291, Canare L-2T2S, Liberty 24-2P-STAR, or equal. Plenum cable, Belden 88761 or equal.

F. Portable Microphone, Enclosure and Breakout Line Level Audio: Cable shall have 4 conductors per channel arranged in star quad double-balanced pairing, #24 stranded conductors of at least 40 tinned annealed copper wires, 100% coverage wrap shield, tinned copper braid shield of approximately 50% coverage, uniformly round form and black PVC jacket. Canare L-4E6S, Belden 8723, WestPenn 355, or equal. Plenum Cable, Belden 88723, Liberty 24-4P-PLCSH-WHT, or equal.

G. Broadband Video Antenna Cable: For runs shorter than 15', RG-59. For runs 15'-50', RG-6.

H. Wireless Microphone Antenna Extension Cable: 50-Ohm coaxial cable, or as directed by microphone manufacturer.

I. Loudspeaker Wire: 14 AWG minimum.

J. UTP Cable: Shall be consistent with Project standards for CAT-6 cable, unless otherwise noted in specification or recommended by hardware manufacturer for use with their equipment.

K. Control: Shall be as recommended by equipment manufacturer, with the appropriate number of conductors for the application.

L. Cable Construction: Contractor shall fabricate interconnecting cables using products defined in this section unless equipment manufacturer-provided cable is of a specialized or proprietary nature. Pre-manufactured cables are subject to prior approval by Consultant.

M. Labels: Labels shall include a white paper or vinyl slip with typed or machine printed designations, secured in place with a wider section of clear heat shrink tubing or integral clear adhesive-backed plastic.

N. Terminations: Provide specialized terminating hardware as required.

O. Schedule: Contractor shall submit schedule prior to installation for Consultant review indicating cable types that will be used on the project.

2.5 CONNECTORS

A. Connectors shall be provided and installed as detailed herein. Connectors installed that do not conform to these standards or that have not been given prior approval by Consultant shall be removed by Contractor and replaced at Contractor's sole expense.

B. HDMI (Video/Audio/Control): Cables to be factory-terminated with molded strain relief.

C. BNC (Video): Video signal BNC connectors shall be 3-piece crimp-on type with insertion barrel and ferrule, and gold flashed crimp-on center pin. Barrel shall provide full circumferential contact with the braid. Fittings shall be sized to fit the cable. Canare BCP-C series or equal. Crimping and die tools shall be Canare TC-1 Hand Crimp Tool with appropriate TCD die sets or equal.

D. RCA (Video): Video signal RCA connectors shall be 3-piece crimp-on type with gold flashed center pin, Canare RCAP-C series or equal. Crimping and die tools shall be Canare TC-1 Hand Crimp Tool with appropriate TCD die sets or equal.

E. F (Video): Video signal F connectors shall be 3-piece crimp-on type with gold flashed crimp-on center pin. Canare FP-C series or equal. Crimping and die tools shall be Canare TC-1 Hand Crimp Tool with appropriate TCD die sets or equal.

F. BNC (RGBHV Graphics): Graphics signal BNC connector shall be crimp-on type with insertion barrel and ferrule, and gold flashed crimp-on center pin. Barrel shall provide full circumferential contact with the braid. Fittings shall be sized to fit the cable. BNC manufacturer, model and tools as recommended by the manufacturer of the RGBHV/graphics cable.

G. XLR: Strain relief shall be sized to fit the cable. Connector shell shall be isolated from all contacts. Neutrik CA-NC series or equal.

H. Mini-XLR: Strain relief shall be sized to fit the cable. Connector shell shall be isolated from all contacts. Switchcraft or equivalent.

I. Phono (RCA): Phono/RCA connectors shall have gold contact and solid center pin with metal strain relief. Canare F-10 or Canare F-09 or equal.

J. Phone (1/4 inch): Reinforced one-piece body shall have brass bar running length of handle. Canare F-15 (TS) or Canare F-16 (TRS) or equal.

K. Mini (1/8 inch): Shall be Canare F-11 (TS) or Canare F-12 (TRS) or equal.

L. RJ45: RJ45 jacks that are field-terminated shall be punch-down type. All flexible connectivity to AV devices shall be factory-molded patch cables. Where a field-terminated plug is required by manufacturer recommendations, Contractor shall use appropriate connector type to the type of cable used (solid vs. stranded).

M. Shielded cable to be terminated with shielded connectors or as required by manufacturer recommendations.

N. Schedule: Contractor shall submit schedule prior to installation for Consultant review indicating connectors that will be used on the project.

2.6 INTERFACE PANELS

A. Finish: Interface plates and connector panels shall be as indicated on Drawings and as specified herein. Finish on custom wall interface plates shall match that of electrical and other work and shall be coordinated with Consultant prior to ordering. Connector panels in equipment racks shall match finish of rack frame and specified/provided blank panels unless called out otherwise in equipment schedules.

B. Floor Boxes: Floor box plates shall be provided wherever connectivity through a floor box is indicated on drawings.

C. Labels: Interface plates and connector panels shall be engraved to show connector functionality. Engravings shall be finished with a contrasting color to plate finish. Verify engraving detail in preconstruction submittal prior to fabrication.

D. Connector Placement: Verify connector layout detail for custom panels in Preconstruction submittal prior to fabrication.

E. Box Mounts: Wall and floor interface plates shall mount to appropriate electrical conduit boxes unless indicated otherwise.

F. Cut-ins: Where no box is provided, Contractor shall cut in appropriate opening for plate, and provide appropriately sized mud-ring/caddy to securely attach plate to wall.

G. Rack Blank Panels: Contractor shall provide all blank rack panels necessary to fill opening in the front of AV equipment racks, whether specified in the equipment schedules or not.

PART 3 – EXECUTION

3.1 EQUIPMENT

A. As required by Section 27 00 00.

1. Safety: Contractor shall use proper structural installation techniques and maintain a minimum 5:1 safety margin.

2. Custom Mounting Finish: Custom mounting hardware shall be painted by Contractor to match either color of wall, ceiling or equipment, at Consultant's discretion.

3.2 INTERCONNECTION

A. As required by Section 27 00 00.

1. Interpretation: Contractor shall make system interconnections as indicated on Drawings and specified herein. Contractor shall interpret Drawings using an understanding of the equipment and general system topology (both existing and future/specified). Contractor shall provide power and control lines to and from power supplies, remotely controlled equipment and other devices even though not explicitly indicated on Drawings or listed in equipment tables.

2. Additional: Contractor shall be responsible for associated equipment signals not specifically documented in provided drawings. These include synchronizing signals, transmitting and receiving antennas, and LAN connections to equipment provided and/or installed by Contractor.

3. Exceptions: Contractor shall not be responsible for unrelated low voltage wiring such as data and voice connections except as they pertain to interface boxes, interface plates, and integrated control systems.

3.3 CABLE MANAGEMENT

A. As required by Section 27 00 00.

1. Above Ceiling: Cabling located above ceilings shall be tied off to and supported by ceiling supports or other structures at a minimum of eighteen (18) inches above the ceiling.

2. Not on Ceiling: Cabling shall not lie on the ceiling.

3. Wall Cabling: Cables installed in a horizontal fashion along wall surfaces shall be installed in surface raceway approved by Owner and Consultant.

4. Floor Cabling: Cabling placed at floor level such as microphones shall be installed on the floor in the shortest possible route to the nearest wall considering traffic patterns and in an enclosure designed for that use and offering protection from foot traffic.

5. Desk Cabling: Where a cable is installed inside desk furniture, a means of protecting the cables and holding cabling to a fixed surface shall be installed.

6. Grommets: Holes in horizontal furniture surfaces for cable pass-through shall be provided with appropriate sized grommet. Grommet shall be black unless otherwise specified or required.

7. Stub-ups: Where conduit is stubbed-up through the floor and exposed, Contractor shall wrap cables with black expandable sleeving and secure at least three (3) inches below level of conduit top.

   a. Where conduit is stubbed-up through floor and concealed within furniture, Contractor shall install tether comprised of aircraft cabling to limit the distance furniture may be moved away from stubbed-up conduit. Cabling service loop exiting stubbed-up conduit and entering furniture shall be longer than the corresponding tether, providing protection against movement of furniture that would otherwise damage installed cabling.

8. Umbilicals: Exposed cable umbilicals, such as those between instructional furniture and a floor- or wall-mounted plate, shall be covered in black expandable sleeving, with neatly finished ends (heat-shrink or Consultant-approved method).

3.4 CONNECTOR TERMINATION

A. As required by Section 27 00 00.

1. Video Connectors: Video connectors (BNC, RCA, and F) shall be terminated using a crimp tool or dies designed specifically for the connectors being applied.
2. XLR Connectors: Terminate XLR type connectors wired pin 2 high, pin 3 low, and pin 1 shield.
3. UTP: UTP cable shall be terminated with appropriate crimps tools or tools specified by manufacturer. Refer to 27 40 00, 2.05 Connectors.

3.5 TRAINING

A. General Information: As required by Section 27 00 00 and following section(s).

B. Coordination and Personnel: Training shall be coordinated with Owner's schedule, and Contractor personnel who provide training are subject to Owner's approval.

3.6 PROJECT CLOSEOUT

A. Completion: System shall be considered complete when all of the following has occurred:

1. Testing has been completed to the satisfaction of Owner and Consultant.
2. Punch-listed items have been addressed to the satisfaction of Owner.
3. As-built drawings and system documentation has been turned over to Owner and Consultant.
4. Complete operational training has been conducted with Owner's staff.
5. System Commissioning Process has been completed.

B. Acceptance: Contractor shall secure written Acceptance of systems in the form of authorized Owner signature on Acceptance Document. This shall constitute the date of Acceptance.

3.7 TESTING & INSPECTION

A. General Information: As required by Section 27 00 00.

B. Notification: Prior to start of testing, provide a list to Consultant of test equipment make, model numbers and calibration dates that will be used.

C. Testing: Contractor shall perform complete testing on system before inspection. Selected systems may be retested during inspection at Owner's discretion.

D. Display/Output checks: Contractor shall verify that visual and audio outputs from the system are high-quality and without noticeable distortion or feedback at normal operating levels.

E. Wiring and Labeling: Contractor shall check all inputs and outputs for correct wiring and labeling.

F. Loudspeakers: Contractor shall measure the impedance of each speaker line leaving the equipment racks. For full range devices, use a frequency of 1000 Hz, for band limited devices, use a frequency appropriate for the operating range of the transducer. When documenting results, Contractor shall include the calculated impedance based on number of units on a line and the size and distance of the run. Contractor shall correct any field readings that differ more than 20% from the calculated impedance. Contractor shall use an electronic polarity checker to test each reinforcement speaker. Speakers shall have the same relative polarity.

G. Computer Graphics: Computer graphics shall be crisp and focused with respect to color alignment. If color alignment is not registered properly, Contractor shall identify source of problem and correct. EDID and other auto-registration features shall be set within AV equipment where required for optimal system performance.

END OF SECTION

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PART 1 – GENERAL

1.1 SCOPE-OF-WORK SUMMARY

A. Unless otherwise noted, the terms “Contractor”, “Offeror”, and “Proposer” are used interchangeably herein and refers to the respondent submitting a proposal for this RFP Section of Work.

B. The Proposer Shall:

1. Provide Equipment, Cable, and Devices described herein or depicted in the construction drawings.
2. Each Section will be bid as add alternates.
3. Provide Labor and Services necessary to integrate each piece of Equipment, Cable, and Device into a fully operational system as a Turn-Key installation without additional charges to the Owner outside the contracted amount.
4. Integrate into the construction any existing or owner furnished equipment and miscellaneous hardware as may be described herein.
5. Maintain timely installations according to the project construction schedule.
6. Provide Owner Training, As-Built documentation, and operations manuals.

C. Collectively Contractor delivered systems shall be as described herein and depicted in the construction drawings and provide for the following:

1. Multimedia Systems , the county may select any or all of the scope items below:
    a. Existing Covered Arena
        i. Local Sound System – PROPOSAL AV#1
            a. Avaya SIP Phone Interface - ADD ALT AV#1a
            b. Restroom and Concessions Audio - ADD ALT AV#1b
            c. Add Covered Penning - ADD ALT AV#1c
    b. Enclosed Expo Hall
        i. Local Sound System – PROPOSAL AV#2
            a. Avaya SIP Phone Interface - ADD ALT AV#2a
            b. Projection Screens w/ Lifts - ADD ALT AV#2b
            c. Projectors and Mounting Systems - ADD ALT AV#2c
            d. Lobby/ Circulation Audio - ADD ALT AV#2d
            e. Restroom and Concessions Audio - ADD ALT AV#2e
    c. Covered Expo Hall
        i. Local Sound System - PROPOSAL AV#3
            a. Add Wireless Antennas to Covered Expo Hall - ADD ALT AV#3a
    d. Wireless Audio Cart - PROPOSAL AV#4
            b. Add Wireless Receiver to EC#1 - ADD ALT AV#4a
            c. Add Wireless Receiver to EC#2 (Existing Covered Arena) - ADD ALT AV#4b
    e. Conference Room Systems with Local inputs and Digital Signage (D2) - PROPOSAL AV#5
        i. Optional 70” LCD Upgrade – ADD ALT AV#5a
    f. Digital signage flat panel display locations (D1) - PROPOSAL AV#6

1.2 GOVERNING REQUIREMENTS

A. The following are general provisions, requirements and expectations of the Technology Contractor delivering Audio & Video Systems equipment and installation for this construction package:

1. This document is intended to provide all hopeful Vendor(s) / Contractor(s), hereafter referred to as the Proposer, with information needed to submit a complete Turnkey solution and proposal for the Owner. The Owner will evaluate the submitted proposals to select a perceived Best Value Vendor to supply and install the Audio & Video Systems for this project as described herein.

2. The work performed shall be of professional quality and installed as would normally be expected by a professional Audio & Video Systems integration Contractor in the primary business of providing quality installations of equivalent systems.
3. The Proposer shall furnish their lump sum price offer to provide a turn-key package in response to the Audio & Video systems specified herein and further defined in the associated Construction Documents.
4. The Contractor shall provide a 100% performance bond, payable to the Owner, until written acceptance by the Owner of all work and materials. The cost of these bonds shall be included in the Contractor's proposal price and shown by separate line item.
5. The Owner shall accept proposals from both manufacturers and authorized resellers of products and systems specified herein and desire to have a competitive choice of local authorized reseller / manufacturers to find the best value for delivery of the systems.
6. The Proposer's proposal response shall include provisioning, installation, configuration, training and warranty support for all systems furnished and provide the Owner a fully functional system.
7. The Successful Proposer's responsibilities shall include but are not limited to the following:
    a. Provide, install, and make fully functional the systems made up of equipment, cabling, devices, and hardware described in this Construction Document and found in Appendix "A" attached hereto.
    b. Integrate into the construction any owner furnished equipment and miscellaneous hardware as may be described herein.
    c. Systems shall include complete Audio & Video Systems of like and uniform design.
    d. Furnish necessary services to integrate each system component into a fully functional package with seamless functionality as described herein.
    e. Integrate into the construction any owner furnished equipment and miscellaneous hardware as may be described herein.
    f. Maintain timely installations according to the project construction schedule and Contract Documents.
    g. Provide Owner with necessary system Training, As-Built documentation, and project manuals.

1.3 DEFINITIONS

A. General Construction common words, acronyms, and phrases found herein this specification and construction documents shall be as defined by and in accordance with AIA Document A201, Fifteenth Edition, 1997.

B. Specific special use of common words, acronyms, and phrases found here in this document shall use the following definitions:

1. "Owner" shall refer to Williamson County Expo Center.
2. "Consultant" shall refer to True North Consultant Group (TNCG)
3. "Successful Contractor" shall imply the Vendor or Contractor that is awarded the project scope of work described herein and enters into a written contract with the Owner or General Contractor to deliver said work.
4. "Proposer" shall mean Vendor, Offeror, Contractor or Subcontractor that submits a proposal to deliver the scope of work described herein this construction document package.
5. "Lump Sum" shall refer to a total amount to deliver full scope of work described inclusive of all materials and labor.
6. "Turn Key" shall refer to all work required to provide the full scope of work described inclusive of all materials and labor and deliver to the Owner a fully functional system.
7. "(MMS)" shall be an acronym for Multimedia Systems
8. "OFCI" shall be an acronym for Owner Furnished & Contractor Installed

1.4 RELATED DOCUMENTS

A. References to the following related documents do not limit or release the Contractor from the responsibility of having the necessary knowledge of other non-referenced related documents that makeup the Construction Document Package.

B. The following Contract Documents are hereby made a part of this Section:

1. AIA Document A201, Fifteenth Edition, 1997

2. Division 1 Documents found in the Project Manual
3. Division 27 documents that collectively make up the Construction Package including:
    a. Section 27 00 00 General Technology Requirements
    b. Section 27 40 00 AV-Multimedia General Requirements
4. Work diagrammatically shown or noted on project drawings
5. Other documents that collectively make up a part of this Construction Document package

1.5 RELATED WORK

A. References to the following specific related work do not limit or release the Contractor from the responsibility of coordination with other trades, or from having the necessary knowledge of other related work.
    1. Work provided by Owner or Owner's Contractors
    2. Work by Electrical Subcontractor
        a. The Project Electrical Contractor will install electrical rough-in for use by the (MMS) Contractor and their devices. The (MMS) Contractor shall have the specific responsibility to fully coordinate their needs with the Electrical Contractor for their equipment AC Power, Back Box Type & Dimensions, Raceway & Pathways
        b. The (MMS) Contractor shall examine construction documents for familiarization of the provided Electrical Rough-in by the Electrical Contractor
        c. Needed Electrical back boxes, raceways, and pathways not provided by the Electrical Contractor, but needed for the (MMS) scope of work shall be the responsibility of the (MMS) Contractor unless noted to the contrary

1.6 UNIT PRICES

A. The Proposer shall provide unit pricing breakdown for all equipment as a line item materials list submitted with their proposal. In the event the Proposal form does not specifically provide a worksheet for requested unit pricing, the Contractor shall provide the unit price list by separate attachment along with their Proposal.

B. The unit price may be used to add or deduct, by change order, quantities of units as represented by the unit price.

C. Failure to provide requested unit prices may result in the rejection of the proposal.

1.7 ALTERNATE & ALTERNATIVE PROPOSALS

A. Alternates
    1. The Base proposal shall include all equipment described herein and / or depicted in the construction-drawing package.
    2. All Alternates shall be listed, Marked as Additive or Deductive Amounts and Priced separately on the proposal form or by Contractor in a separate attachment if Proposal form does specifically have a place for Alternate prices.

1.8 PERFORMANCE REQUIREMENTS & REFERENCES

A. Referenced standards and / or procedures will be binding on Contractor and all work will be judged against such standards and procedures unless otherwise stated in writing.

B. The Contractor shall be held responsible for and adhere to Manufacturers' installation recommendations and guidelines.

C. Other Reference Standards:
    1. Audio Engineering Society (AES) Standards
    2. BICSI/InfoComm International AVDRAM (AV Design Reference Manual
    3. ISO / ICS 33.160.01 through 33.160.99

1.9 SUBMITTALS

A. General Requirements
    1. Provide a full electronic file copy in PDF format of all paper document submittals. The PDF Files shall be delivered on Thumb-Drive and Electronically via a "DropBox.com" or equivalent.

2. Contractor shall submit FULL System Shop Drawings as described herein to the General Contractor and Consultant for review within (30) thirty days from the date of the contract. Failure to comply with this requirement may be cause for cancellation of the contract without penalty or cost to the Owner / General Contractor.
3. Present submitted documents in a clear and thorough manner, include original drawings that illustrate diagrammatically Contractor's intent to assemble, construct, fabricate, build, and supply the systems and equipment as described by the collective specifications.
4. Product Data Sheets (Cut-Sheets) are only required on products that differ from that which is specifically specified. This includes a revised model number or part number, replacement model, or that differ in any way from devices described herein.
5. Submit only pages that are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Provide required performance standard information, descriptive characteristics, capacities and wiring requirements for system control.
6. Modify manufacturer’s diagrams and schematic drawings to supplement standard information and provide information specifically applicable to the Work.
7. Omit information on product cut sheet not applicable to this project
8. Identify each detail element of drawings by reference to full drawing sheet number.
9. Submit where applicable any and all finish options for prior approval where not specifically specified.
10. Title each drawing with the project name, drawing name, installing Contractor’s name, and Consultant’s name True North Consulting Group.

B. Submittal Conditions

1. The Contractor shall not consider the Consultant or Owner’s review of submittals to be exhaustive or complete in every detail. Approval of shop drawings or submittals including substitutions indicates only the acceptance of the Contractor’s apparent intent to comply with general design or method of construction and quality as specified. The finished product must meet functional requirements, operations, arrangements, and quantities and comply with the contract documents unless specifically approved to the contrary.
2. The Contractor shall be held responsible for delivery of systems as specified any errors or omissions in the submittals shall not relieve said Contractor of responsibility to deliver complete systems as specified, that fully meets or exceeds the minimum requirements set forth by the specifications, drawings and contract documents.
3. The Contractor shall be responsible for deviations in submittals from the requirements of Contract Documents, unless Consultant gives specific written acceptance specifically identifying such deviation. The Consultant shall review and stamp submittals for general conformance to design intent only. This stamped review alone does not imply any specific written acceptance of deviations.
4. Submittals that, in the Consultant’s opinion, are incomplete, deviate significantly from the requirements of the Contract Documents, or contain numerous errors shall be returned, without review, for rework and are to be re-submitted.
5. Submittals of front end shop drawings and other items shall not be in more than two (2) partial submittals, or as allowed by the Consultant. Do to the complexity of the systems the consultant reserves the right to require full Submittals prior to Submittal Review.
6. If shop drawings are rejected for any reason, the Contractor shall correct and resubmit within seven (7) working days. The Contractor shall always be required to obtain stamped approval of submittals prior to any fabrication or installation of equipment.
7. The submittals must be received and stamped reviewed by the Consultant prior to procurement of equipment or commencement of work. Any prior work performed is at the Contractor’s own risk.
8. Failure to obtain shop-drawing approval within forty five (45) days of contract award, where the delay is due to the poor performance of the Contractor, may be cause for cancellation of the contract without penalty to Owner / General Contractor.
9. Do not fabricate products or begin work that requires submittals until return of stamped reviewed submittals with Consultant acceptance. If work does progress prior to this, the Contractor shall have proceeded at his or her own risk.
10. Any Contractor noted corrections, changes, and additions, as may be necessary to the design document drawings, shall clearly show any such changes by a noted cloud around the change.

C. Front End Submittal Requirements

1. Complete project material list for each item and or device to be furnished. The Materials List is required to include the following categories:
    a. Quantity provided
    b. Manufacturer name
    c. Model Numbers
    d. Product Description
    e. Product value in the form of cost to the project
2. Product Data Sheets (Cut-Sheets) are only required on products that differ from that which is specifically specified. Product Cut-Sheets for each item furnished shall be submitted as follows:
    a. As 8-1/2” by 11” product catalog specification sheet from the manufacturer.
    b. The products shall be organized such that they match the materials list order.
    c. Where more than one item appears on a page, the Contractor shall mark the appropriate item, for easy identification
    d. Submit only pages that are pertinent, delete or mark through information not applicable, mark each copy of printed data to identify pertinent products
    e. Reference pertinent products to Specification Section and Article number, if more than one Section of work.
    f. Highlight reference standards, performance characteristics, capacities, component parts, finishes; and dimensions
    g. Modify manufacturer’s standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work or scope
3. Construction Drawings:
    a. Comprehensive system drawings with device locations overlaid on project floor plans, system schematic diagrams in block format, and detail of all custom fabrications including but not limited to device wall plates. Drawings shall be prepared and submitted in E1 Size 42” x 30” format.
    b. Drawings shall be executed at an appropriate scale as the project would require to clearly read pertinent detail, but for equipment layouts not smaller than 1/4" = 1'- 0" and the floor plans and reflected ceiling plans, not smaller then 1/16” = 1'-0".
    c. The shop drawings shall include: Identification of equipment manufacturer, equipment model numbers, cable types, cable identification numbers, cable color codes, cable paths, plate and panel details, consoles and enclosures’ details. Additionally, equipment rack layouts showing locations of all rack-mounted equipment, comprehensive system schematic block diagrams (one-line drawings showing device connectivity), equipment rack elevations and custom fabricated equipment.
    d. Shop drawings that depict all devices and device locations to be installed.
    e. Shop drawings that depict all cabling infrastructure to be installed. Cabling shall be overlaid on floor plan drawings.
    f. Comprehensive system schematic wiring diagrams showing detailed point-to-point connections to and between all equipment.
    g. Elevation drawings showing intended equipment room layouts.
    h. Elevation drawings showing intended equipment rack layouts. The equipment rack layouts shall show locations of all rack mounted equipment and identification of equipment as shown on the system schematic diagram.
    i. Detail drawings showing intended fabricated equipment, custom work, and wall plates, etc.
    j. Complete wire and cable riser diagram showing path and location of all cable to and between equipment; this cable shall be overlaid on facility floor plan. Include cable types, cable identification numbers, and color codes.
4. Plate or panel details:
    a. Drawings shall include examples of proposed nomenclature and labeling scheme intended for use in labeling plates, equipment, cables, etc.

b. Connector numbering, e.g. “Mic # 1, Mic #2, used as examples in Construction Drawing set shall be submitted in full sequential numbering between plates as proposed to be installed. The Contractor is responsible for receiving review approval from Consultant prior to ordering.

c. Detail dimensional drawings of custom plates or panels.

d. Consoles, enclosures or support tables.

5. Wire and Cables

a. The Contractor shall provide their intended Wire and Cable color code strategy for the cabling between equipment. The Contractor must receive approval of color code prior to ordering cabling.

b. Provide complete wire and cable riser diagram showing pathways and locations of all wire and cables to and between equipment. The cabling infrastructure shall be overlaid on facility floor plan.

D. Project Closeout Submittals (As-Built Documents)

1. General

a. When the Contractor considers installation substantially complete, provide to Consultant a written report listing all known system deficiencies compared to specified requirements. Also furnish a timeline for correction of any deficiencies.

b. Submit a written report detailing the results of initial adjustments and verification tests including all relevant drawings, charts, and photographs. This report shall be completed and submitted for review at least five (5) days prior to acceptance verification walkthrough by the Owner and Consultant.

c. The Contractor shall provide written request, requesting a final acceptance walkthrough and demonstration. This request shall certify Contractor’s declaration of completion with the project and that to the best of their knowledge all systems are installed and fully functional and ready for review by Consultant.

d. Submit one complete copy of each manual and other closeout documents for review ten (10) days prior to the final acceptance walkthrough.

e. At the time of the walkthrough, the Contractor shall transfer and turnover to the Owner’s or Owner’s represent the following:

i. All ancillary and portable equipment such as microphone cables, patch cables, microphones, camcorders, spare equipment, etc.

ii. An installable and actual copy of all software used and or created for the system including the source code.

iii. Passwords

iv. Keys

f. After the walkthrough review, make any noted corrections and / or additions required by Consultant. Provide corrected copies of final as-built documents.

g. Closeout Submittals shall be bound in three-ring binders with clear vinyl pockets on cover and spine for title cards with project name and manual volume numbers. Provide table of contents and tabular dividers with legends for each section.

h. Closeout Submittals shall be printed originals, not photocopied, unless more copies of a manual are required than the number of units used in the system. For custom circuits or modifications, provide a thorough description of the purpose, function, specifications, and operation

2. System Documentation, prepare the following system manuals and other information to accompany the finished installed system. These documents shall be provided prior to the final acceptance walkthrough with the Consultant:

a. System Operations Manual(s)

b. System Service Manual(s) and Maintenance Instructions

c. As-built Drawings and other Documents

d. Proposed Training Documentation and Materials

e. Test Reports and Results

f. Statements of Contractor’s Warrantee

3. The System Operations Manual shall assume the reader to be technically inexperienced and unfamiliar with the operation of the system. This manual shall step a user through common and typical use of each system or subsystem. The manual shall include the following:
    a. Overall system operation and instructions
    b. Complete and typical operating procedures for the equipment by activity
    c. "Quick Setup" instructions for use by inexperienced users working under time pressure
4. Service Manuals & Maintenance Instructions include clear statements of:
    a. Original Manufacturer’s Instruction / Technical Service Manuals for all equipment. Instruction manuals shall be printed originals, not photocopied, unless more copies of a manual are required than the number of units provided
    b. The terms and coverage period of the Manufacturers’ and Contractor's warranty
    c. Contractor's service department phone number(s) and hours
    d. Required maintenance schedules for any equipment
    e. Instructions for the proper maintenance of products
    f. Instructions for the Owner to obtain service on installed systems and equipment
    g. For custom circuits or modifications, provide a thorough description of the purpose, function, device modification, and operation
    h. Provide a list of correct settings for all semi-fixed controls (this shall be finalized after acceptance testing)
    i. Any other pertinent data generated during the project or required for future service.
5. System As-Built Documents
    a. Provide complete and corrected as-built drawings at the time of final system testing and Consultant / Owner demonstration.
    b. Original submittals shall be updated to become As-built drawings at the closeout of the project.
    c. Prior to final walkthrough of completed job, the Contractor shall supply one (1) corrected as-built set of Drawings showing the work as installed. Consultant, with any necessary noted corrections that may be required, shall return this drawing set to Contractor. Contractor shall have corrected the installation work as noted and have updated the drawings and have them present at final walkthrough. Upon final acceptance by Owner, the Contractor shall provide five (5) copies of as-built drawings and manuals.
    d. The Contractor shall also furnish to Owner a copy of the complete set of electronic CAD files, in DFX or DWG format, along with a complete PDF file copy of all As-Built drawings.
    e. Include as part of the As-built drawings the original submittals with updates to reflect the actual installed work.
    f. Any other pertinent data generated during the project or required for future service.
6. Owner Training
    a. Contractor shall provide a proposed Owner training plan for installed systems for review by Consultant prior to Owner Training
    b. Training plan shall comply with training requirements found herein under the Owner Training Requirements.
7. Test Reports and Results
8. Warranty Information
    a. Warranty information: Include clear statements of the terms and coverage periods for all equipment.
    b. Provide Contractor’s service department phone number(s) and hours, maintenance schedule and description of products recommended for use in maintenance.
    c. The Contractor shall complete and deliver to the Owner a warranty card for each piece of equipment covered by manufacturer's warranty.

1.10 DELIVERY, STORAGE, AND HANDLING

A. General

1. The Project General Contractor shall have final approval authority for any Subcontractor's needs regarding material Delivery, Storage, and Protection.
2. Storage of materials installed or stored will remain the full responsibility of the Contractor until written acceptance of the competed system by the Owner.
3. Refer to Delivery, Storage, and Handling found in Section 27 41 00.

B. Delivery

1. The Contractor shall have full responsibility for delivery of all materials needed to meet requirements of this specification package.
2. The Contractor shall coordinate with the General Contractor any delivery requirements they may have.

C. Storage

1. Storage of materials shall remain the full responsibility of the Contractor, until the Owner has accepted the work and materials in writing.
2. The Contractor shall coordinate with the General Contractor any need for storage requirements at the site of work.

D. Handling

1. The Contractor shall take necessary steps to protect all materials from:
    a. Dents
    b. Scratches
    c. Dust
    d. Temperature
    e. Moisture and Weather
    f. Cutting
    g. Other hazardous conditions
2. The Contractor shall replace any damaged material as required by the General Contractor or Consultant.

1.11 PROJECT CONDITIONS

A. Existing Conditions

1. This work is New Construction and Renovations
2. The Contractor shall be responsible to visit the site to familiarize themselves with site conditions.
3. The Contractor shall be responsible to closely coordinate with other trades including but not limited to:
    a. Electrical Contractor
    b. Data Contractor
4. Electrical Contractor
    a. Electrical rough-ins shall be provided by the electrical contractor, including conduit, raceways and electrical back boxes or box eliminators. Any exceptions shall be specifically noted in the construction document drawings.
    b. Locations not requiring electrical rough-ins where this scope-of-work requires a special device shall be placed in fishable walls. This shall include control system touch panel, push to talk microphone plate, and other device locations noted to need final coordination with the Owner or Consultant.
    c. In locations where electrical conduits or raceways are shown and not provided by the Electrical Contractor, the installing Contractor for this scope-of-work shall provide their sleeved penetrations, raceways, and cable pathways, including coring as may be required.

1.12 WARRANTY

1. Refer to Warranty found in Section 27 00 00
2. Warranty/Maintenance Program
    a. All materials, equipment, parts and labor shall be guaranteed (warranted) for a minimum warranty period of two years (24 months).

b. Warranty period shall begin immediately following the date of final acceptance in writing by the Owner and Project Consultant.

c. During the first two (2) year Warranty period, all warranty repairs shall include parts & labor.

d. The Proposer shall, upon notification of any malfunction, make the necessary repairs, including labor and materials, at no cost to the Owner.

e. Contractor's Warranty shall include the following provisions:

i. Contractor's statements of long-term commitment to the sales and service of their products in the project's geographic location.

ii. The Contractor shall warrant that the system(s) shall be provided free from defects and shall perform under usual usage and with continued service for a period of two years after written final acceptance by the Owner or Consultant.

iii. The Contractor guarantees replacement of all defective materials, parts, components, equipment, including labor, free of charge to the Owner during the Warranty period, when made necessary from normal usage and / or wear.

iv. The Contractor shall provide on and off site technical support, software patches, and labor for any necessary site repairs.

v. The Contractor shall provide a full service office, capable of troubleshooting and repairing any system failure in a timely fashion as required by these specification documents

vi. Warranty service shall be delivered within regular facility access hours set forth by the Owner

3. The Warranty more specifically, shall be provided in accordance with the following:

a. For major system failures: "major system failures" are failures that prohibit the use of a typical system function in one or more instructional spaces or pose a life safety concern. Such failures are considered a major impact to the Owner. The Contractor shall provide service correcting the impact within eight (8) hours after notification by the Owner or his representative and no later than the next business day if the notification falls after noon of the notification date

b. For minor system failures: "minor system failures" are failures that do not inhibit typical system usage in an instructional space or pose no life safety concern. The Contractor shall provide service within forty-eight (48) hours, after notification by the Owner or his representative.

c. The Owner reserves the right to make the final determination of major or minor system failures and the right to coordinate the best times for service of any system failure.

d. The Contractor shall supply Service Request forms and or proper contact procedure to the Owner with instructions for proper notification of the Contractor for warranty service. By following said instructions, the Owner shall constitute proper notification for any need warranty service.

4. The Contractor shall provide an optional extended one-year warranty as an Owner Alternate option. The extended one-year warranty shall extend the warranty for one additional year and cover all technology systems that are a part of this specification package. The warranty shall be equal to the base 2 year warranty described above and shall include on and off sight technical support, materials, software patches, and labor for any necessary site repairs.

5. The Contractor shall offer this extended warranty price to the Owner for their acceptance up to and including thirty days after basic warranty expiration. The Contractor shall be responsible for contacting the Owner in writing 30 days prior to the expiration of this offer. Failure to do so shall constitute an extension of the extended warranty offer.

1.13RELATED DOCUMENTS

A. Documents: Provisions of General Conditions, Supplementary Conditions, and the sections included under Procurement & Contract Requirements are included as part of this section as though bound herein.

PART 2 – PRODUCTS

2.1 GENERAL:

A. The Contractor is bound by the intent of these Specifications to provide a complete and functional technology system as described herein, of high professional quality and reliability, and that meets or exceeds standards that are currently established for such systems.

B. Provide all necessary labor, materials, tools, transportation, services, ancillary items, and coordination to furnish the Owner a complete and fully functional turnkey installation as described herein.

C. The Contractor warrants that they will provide professional services, to meet or exceed performance standards and industry recommendations that relate to the scope of work under contract, and that the workmen or system installers are experienced and regularly in the business of installing such systems as specified herein.

D. All work shall be in accordance with the respective drawings, written specifications, supplemental information, industry standards, manufacturer specific installation procedure, trade practice, and applicable regulatory agencies.

E. The Contractor(s) shall thoroughly familiarize themselves with complete construction documents, Proposal package information and all necessary details of the complete set of drawings and specifications before submitting their Proposal.

F. Ancillary and Accessory Items

1. The Proposer shall provide ancillary and required accessory items necessary to furnish to the Owner a complete and fully functional system.

2. The exclusion of / or limitation in the language used in the drawings or specifications shall not be interpreted as meaning that ancillary or accessories items of work or equipment necessary to complete or make the installed system fully functional can be omitted.

3. The mention in writing or representation by depiction materials, services, or operations within this specification document and or Proposal package is binding upon the Proposer to include and provides such items, services, and operations without additional charge to Owner.

a. Exceptions shall be noted by the acronym (NIC) “Not In Contract” or (OFE) “Owner Furnished Equipment.” If this notation does not appear, then the Proposer shall assume the need to provide the item in question.

4. The Proposer shall receive no allowances because of omissions in work due to unfamiliarity or their misunderstanding of Proposal package.

G. Drawing Symbols

1. The project scope drawings utilize symbols and schematic block diagrams to indicate various items of work. Neither of these has any dimensional significance nor do they delineate all items that may be required for the intended construction and installation.

2. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings and described in the written specifications. The Proposer shall not make limiting interpretation that provides for incomplete work or a non-functioning system.

H. Document Discrepancy

1. In the event of an inconsistency or discrepancy that may exist in or between parts of these Construction Documents, the following direction shall be followed and shall govern:

a. The document, section, phrase, or requirement with better quality, more stringent requirement, or greater amount or quantity of work or material shall apply and shall be expected, delivered and used. Such work or material shall be provided by the Contractor and installed at no additional cost to the Owner.

I. Omissions

1. The omission of or express reference to any part(s) necessary for or reasonably incidental to a complete and fully functional system and installation as intended shall not be construed as a release from the Proposer providing and installing such parts.

2.2 MANUFACTURERS

A. Governing Clauses

1. It is not the intent of these specifications to limit or restrict submission of proposals for products or systems by manufacturers other than those specified.

2. The products specified are intended to establish a minimum baseline of operational, functional, and performance based system expectations that all proposed products must meet or exceed by features, functionality and quality.

3. The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specified system standards.

4. If the proposed system does not meet all of the features or functions described herein, then the Proposer shall identify and list those exceptions in their proposal submittal by separate cover titled “System Exceptions” in red letters.
5. The Proposer shall not be automatically disqualified for not meeting one or more requirements. The Owner shall evaluate proposals on their overall value; all proposals shall be fully considered for best value.
6. Reference to specific equipment manufacturers does not imply that all products produced by that manufacturer meet the specification requirements.

2.3 SOFTWARE TERMS & CONDITIONS

A. The successful Contractor providing software for this project affirms that it possesses complete and valid title and rights to furnish the said software. Further that it possesses legal right to sell, transfer, or license the software to the Owner.

B. The Successful Contractor herby agrees to protect, indemnify, and hold the Owner harmless against any and all claims, suits, or proceedings for patent, trademark, copyright, or franchise infringement arising out of, or resulting from, the installation or use of software or any part of the Contractor provided materials or equipment.

C. Provide the Owner with an installable and exact copy of each software program installed and running on any system furnished. The software delivered to the Owner shall include the source code. Additionally provide a compiled copy that is user installable. Provide all software to the owner on a DVD, CD, Thumb-Drive or other format acceptable to the Owner.

2.4 MULTIMEDIA SYSTEMS (MMS)

A. General

1. The (MMS) described herein and diagrammatically shown in the construction drawings shall set minimum standards, features, and functions to be delivered. The brief descriptions below shall not be interpreted as limiting to functions and / or features required. The Contractor shall specifically identify in their proposal in (RED) letters or yellow highlight any exceptions to features, functions, or devices that would deviate from those specified, depicted, or implied requirements. Or any that would not be delivered by the Contractor’s proposed system or products.

B. Schematics

1. Contractor shall provide all components, cables, and accessories necessary for turnkey functional systems in each AV space. Functional requirements shall be determined by referring to the schematic diagrams and other information contained in the technology detail sheets as well as the floor plans.
2. Omission below of any necessary components shall not be misconstrued as an exemption from providing said components. The AV components described below are only an indication of some of the major pieces and functionality required, not to be interpreted as a complete product schedule.

C. Schedules

1. The technology drawing set includes schedules for the following items to clarify requirements
    a. Flat panel displays (including digital signage, presentation/classroom spaces, and huddle spaces)
        i. All displays are OFCI. Mounts and other equipment is CFCI.
    b. Loudspeakers (including which contractor is responsible for a given loudspeaker)
    c. Projection systems (projectors and screens)
2. Contractor shall provide components as described and specified in the schedules depicted in the drawing set.

D. Typical Conference Room/ Multimedia System

1. Provide for each typical conference room and similar spaces (anywhere that a “D2” symbol is located on the plans) the following components
    a. Wall input plate
        i. Dual HDMI white decora extender
    b. In-wall equipment box behind display with:
        i. HDMI extender receiver
    c. Wall controller

i. Minimum of the following control ports

a. Ethernet w/ control over Ethernet for at least 4 devices

b. (1) I/O

c. (2) RS-232

d. (2) Relays

ii. Minimum of 8 buttons and volume knob with the following capacities

a. Display On/Off/ AV Mute or Blank

b. Volume Up/Down/Mute

c. Source select/switching

E. Existing Arena

a. Scope of work:

i. The existing arena audio system will be comprised of a distributed audio system. Wiring and termination will be into an Enclosed Equipment Cabinet (EC2) located in the Show room office storage.

ii. A Dante enabled DSP will be installed and field/ rack Inputs and Outputs will be connected to the DSP. The contractor will provide programming to allow the system to be completely computer and/ or control system controlled. The DSP shall be configured to allow for the system to function without a live operator.

iii. The AV Contractor will be required to provide an AV network and interconnect the Dante enabled systems over OM3\ OM4 fiber and Cisco Layer 3 switching hardware. The AV Contractor will work with the county to connect the AV network on a VLAN within the county network and uplink into the MDF.

b. Refer to plans for functional and device requirements.

c. The contractor will also provide the following as complimentary hardware.

i. Qty (4) ULXD1 Shure Digital Wireless Bodypack Transmitter with Miniature 4-Pin Connector

ii. Qty (4) ULXD2/B58 Shure Digital Wireless Handheld Transmitter with Beta-58

iii. Qty (4) CO-8WS-XSH-BE Point Source Earset Mic

iv. Qty (4) CO-8WL-XSH-BE Point Source Lapel Mic

v. Qty (1) SBC800-US Shure 8-Bay Shure Battery Charger

vi. Qty (1) SB900-8 Shure 8 Pack Shure Lithium-Ion Rechargeable Batteries

vii. Qty (2) D4LK Middle Atlantic 4RU Lockable Drawer

viii. Conquest Sound Audio Patch Cables (Note: All Cables Must Be Red Heat Shrink Labeled with 2 Lines; 1st Line – PROPERTY OF WILLIAMSON COUNTY, 2nd Line – EXPO CENTER

a. (4) OPMICN 10' Star Quad Mic Cable w/Neutrik X-Series Connectors Blue Boots

b. (4) OPMICN 25' Star Quad Mic Cable w/Neutrik X-Series Connectors Green Boots

c. (4) OPMICN 50' Star Quad Mic Cable w/Neutrik X-Series Connectors Purple Boots

d. (2) OPMICN 100' Star Quad Mic Cable w/Neutrik X-Series Connectors Red Boots

F. Covered Penning

a. Scope of work:

i. The area is an extension of the Existing Arena and consists of two (2) speakers and a volume control in the show office rack.

G. Enclosed Expo

a. Scope of Work

i. The enclosed expo audio system is a divisible combinable space and will be comprised of a distributed audio system. Wiring and termination will be into an Enclosed Equipment Cabinet (EC1) which is located in the AV storage room off of the Expo Hall.

ii. A Dante enabled DSP shall be interconnected via fiber, network switch, and Dante to the EC2 cabinet in the show office. The field and rack Inputs and Outputs will be connected to the DSP. The contractor will provide programming to allow the system to be completely computer and/ or control system controlled. The DSP shall be configured to allow for the system to function without a live operator.

iii. The contractor will provide pricing for a Crestron Digital Media Switching and Control system with 10” control panels mounted into each of the EC1 and EC2 Cabinets. Programming must be performed by an approved authorized independent programmer. The contractor will create an initial plan of touchpanel pages for control and submit for consultant and owner review prior to any programming.

iv. The contractor will provide pricing for the projection systems. The projector in each Hall on the project East side shall be capable of rotating 90 degrees and be focused on the project west walls when the entire hall is in use. Typical use is considered to be a divided hall with projectors in each hall facing Project North or South.

ii. The contractor will provide pricing for installing the projection screens and projection screen lifts. Control for lifts and screens will be interfaced into the control system over IP or relay.

b. Refer to plans for functional and device requirements.

c. The contractor will also provide the following as complimentary hardware.

i. Qty (4) ULXD1 Shure Digital Wireless Bodypack Transmitter with Miniature 4-Pin Connector

ii. Qty (4) ULXD2/B58 Shure Digital Wireless Handheld Transmitter with Beta-58

iii. Qty (4) CO-8WS-XSH-BE Point Source Earset Mic

iv. Qty (4) CO-8WL-XSH-BE Point Source Lapel Mic

v. Qty (1) SBC800-US Shure 8-Bay Shure Battery Charger

vi. Qty (1) SB900-8 Shure 8 Pack Shure Lithium-Ion Rechargeable Batteries

vii. Qty (2) D4LK Middle Atlantic 4RU Lockable Drawer

viii. Conquest Sound Audio Patch Cables (Note: All Cables Must Be Red Heat Shrink Labeled with 2 Lines; 1st Line – PROPERTY OF WILLIAMSON COUNTY, 2nd Line – EXPO CENTER

a. (8) OPMICN 10' Star Quad Mic Cable w/Neutrik X-Series Connectors Blue Boots

b. (8) OPMICN 25' Star Quad Mic Cable w/Neutrik X-Series Connectors Green Boots

c. (8) OPMICN 50' Star Quad Mic Cable w/Neutrik X-Series Connectors Purple Boots

d. (4) OPMICN 100' Star Quad Mic Cable w/Neutrik X-Series Connectors Red Boots

e. Provide 4” X 8’ long strip of oak with cable organizer spools. Mount to wall near EC1.

H. Covered Expo

a. Scope of work:

i. The enclosed expo audio system will be comprised of a distributed audio system. Wiring and termination will be to the EC1 cabinet in the Enclosed Expo Hall.

ii. An additional Dante enabled DSP, interconnected via DANTE to the EC2 cabinet in the show office, and Inputs and Outputs from the covered expo will be connected to the DSP. The contractor will provide programming to allow the system to be completely computer and/ or control system controlled. The DSP shall be configured to allow for the system to function without a live operator.

iii. It is anticipated that the Covered Expo area will primarily utilize the portable wireless audio cart, however all three areas shall be capable of utilizing the wireless cart to be utilized in their respective areas.

b. Refer to plans for functional and device requirements.

I. Digital Signage System

a. Refer to the plans and display schedule for digital signage locations and requirements

b. The digital signage sources shall be IP networkable and programing should be performed via a web browser.

i. Provide – Digital Tightrope Carousel Hardware and licenses.

2.5 EQUIPMENT GENERAL

A. This document sets forth the minimum Multimedia System (MMS) equipment requirements. Described are both technical performance specifications along with certain desired features and functions that the Contractor must provide with their proposed system solution.

B. The Construction Drawings shall be referenced for specific devices and interconnections of said devices and together with this written specification form the required minimum (MMS) equipment requirements.

C. The Proposer shall provide one lump sum price for a complete turn-key-system installation per the construction documents. This lump sum price shall be inclusive of all work and material needed for fully functional systems.

D. The Proposer shall provide a lump sum price for each Alternate requested and list them separately from the base proposal lump sum price.

E. Collectively the described system forms certain desired features and functions that the Contractor shall provide with their proposed system solution.

1. The Proposer must state clearly in their proposal any exceptions to the equipment and or requirements found in the construction documents to that offered in the Contractors proposal.

2. Additionally to exceptions, the Proposer shall list clearly any value added features and or functions their proposed equipment may offers over and above the stated minimums.

3. MMS equipment provided and installed shall be as depicted or shown on the construction drawings, described herein this document or more specifically under the System Description above.

4. The Contractor shall be aware that the construction documents in totality identifies the requirements and equipment required to deliver the desired performance, this means the written specifications, drawings, and associated equipment list or generally known in totality as the “Construction Documents.”

F. Proposal Equipment List

1. The Proposer shall provide along with their Proposal Bid Form Provide complete project material/equipment list for each device to be furnished. The Materials List is required to include the following completed categories the following:

a. Quantity of item provided

b. Manufacturer of item

c. Model number of item

d. Description of item

e. Individual price of item

f. Extended price for quantity of items

g. Total of Proposal in the form of Lump Sum Amount

2. The Project Material / Equipment List shall be complete in detail and provided in XL spreadsheet file form and as a PDF document included and attached to the Proposal Form.

G. Contractor shall also furnish any ancillary equipment, devices, cables, connectors, and hardware necessary to provide a complete and functional system.

2.6 ALTERNATES

A. Alternates shall be identified clearly on the proposal with the associated Alternate number as listed below. State clearly if the alternate is an Additive or Deductive price to the base bid lump sum amount.

1. Refer to paragraph 1.6 above.

2.7 MAINTENANCE MANUALS

A. Contractor shall produce a maintenance manual showing interconnection of equipment and any special procedures necessary for proper operation of the systems.

PART 3 – EXECUTION

3.1 EXAMINATION

A. The Contractor's responsibilities

1. Examine all related construction documents to ensure compliance of them.

2. Examine and coordinate the installation schedule to comply with contracted timeline.
3. Examine the facility and construction documents to the extent necessary to plan for efficient installation strategies prior to the delivery of materials to the site or the commencement of work.
4. Failure to make the required examinations shall not result in any additional charges to the Owner.

3.2 INSTALLATION

A. Requirements and Responsibilities

1. The Contractor shall furnish, deliver, transport, erect, install, configure, and connect completely all of the materials and equipment described herein, found or depicted on the construction document package and drawings. The Contractor shall supply all other incidental material required, such as interconnecting cables, connectors, and hardware to make the work complete and leave all systems in first class operating condition.
2. The Contractor shall make this a “Turnkey Project” ready for the Owner’s use.
3. Coordinate with other trades working in the facility to provide seamless installation.
4. In the event of any conflicts, delays or improper preparatory work by other trades or existing conditions, notify the General Contractor, Consultant and Owner.
5. Provide cut-in boxes or approved clamping rings where back boxes are required but not provided by Electrical Contractor.
6. The Contractor shall coordinate their requirements for proper ground system to all equipment.
7. Coordinate and verify with the Electrical Contractor, the installation of needed cable raceways
8. The Contractor shall not use any other trade’s work or material for support or fastening. Example: ceiling grid support wires cannot be used to support cable hangers, etc. Any exceptions shall be noted or coordinated in writing with the General Contractor.
9. The Contractor shall not shoot, fasten, or screw hangers to the roof deck. Any exceptions shall be noted or coordinated in writing with the General Contractor.
10. The Contractor shall coordinate clearance for cable paths and coordinate clearance for access above cable tray to easily add or remove cable from the cable tray they install.
11. A Contractor installing any equipment shall be responsible for providing all interconnecting cables to and/or between same equipment that may be required to make equipment fully operational.
12. Equipment shall be fabricated with equipment mounted into racks, enclosures, and consoles and be fully wired and tested, before delivery to job site.
13. With the installation of equipment and cables, consideration shall be given not only to operation efficiency but also to overall aesthetic factors to comply with industry standards and practices.
14. Contractor’s construction, fabrication, installation, or delivery of materials must comply with applicable standards and practices.
15. The Contractor shall coordinate and field-verify the electrical rough-ins provided for their use by the Electrical Contractor.
16. The Contractor shall remove and replace cabling that is found to have been stretched or pulled past the recommended pulling tension during installation.
17. The Contractor shall install all operational software, as required by equipment and ensure that such software is fully functional and operational. In the event of software conflicts due to upgrades, bugs, or other reasons, the Contractor shall provide solutions suitable to Owner at no additional cost.
18. The Contractor shall be responsible for coordination with Owner’s staff the software configuration options of software configurable systems.
19. The Contractor shall provide to the Owner keys for all lockable equipment installed.
20. The Contractor shall provide all passwords for any system or equipment that may use or be locked with a password.

B. Procedures & Methods

1. The Contractor shall provide rack shelves or rack mounting ears for any equipment that is not rack mountable. All equipment installed using shelves shall be fastened to the rack shelf. If Velcro is used to

fasten any equipment, the Velcro must be fastened with screws. Adhesive is not an acceptable means to fasten any equipment.

2. Supplementary equipment within equipment racks, such as special assemblies that are not rack mountable or fastened to rack shelves shall be mounted on painted black high grade wooden boards running vertically on side rails of equipment racks. The same wooden strips shall also be used to support cable tie support bars for lacing cables to equipment.
3. Equipment shall be mounted into racks and consoles, and fully wired and tested, before delivery to job site.
4. Equipment and enclosures shall be mounted plumb and square in relation to the structure.
5. Devices, wire raceways, and equipment, except for portable equipment, shall be permanently attached to equipment racks or building structure and held firmly in place with screws or fasteners. Adhesives alone shall not be accepted as fasteners.
6. All equipment mounting boards in head-end rooms, MER's, electrical, or TR closets shall be painted white or black as location dictates with fire retardant paint. The mounting boards shall be made of high-grade plywood.

C. Wire and Cable Requirements

1. Cable installation must follow related TIA/EIA standards and recommendations, including methodology as noted in TIA/EIA 569 - Part 4.6 Ceiling Pathways. Specifically, including sections 4.6.1 General, 4.6.2 Design Guidelines, and 4.6.5 Cable Support.
2. All equipment rack wiring and cabling shall be neatly laced, ends dressed with heat shrink tubing, and all cables shall have service loops between the horizontal tie bar and the connection to equipment. Rack cabling shall be adequately supported with tie wraps or Velcro wire wraps and horizontal support bars to rack frame as it enters or exits the front or back of equipment.
3. There shall be no unmarked cables at any place in any part of any system this includes both in equipment racks and outside of equipment racks. Label markings codes used on cables shall correspond and be shown clearly on as built drawings
4. All cables shall be separated into like groups according to signal or power levels and routed separately to eliminate signal contamination and cross-talk, this includes both in equipment racks and outside of equipment racks.
5. All power cables, control cables, and high level cables shall be grouped to one side of the equipment rack while low level cables shall be grouped to the other side.
6. All cables within equipment racks will use Velcro wire wraps to manage and bundle cables. Velcro strips will be no more than a ¼" wide.
7. All cabling located above ceilings shall be tied off to and supported by ceiling supports or other structures at a minimum of eighteen inches above the ceiling.
8. Cabling shall be placed in conduit where exposed in gym roof joist. Exposed cables shall not be allowed.

D. Equipment and Cable Labels:

1. All cables, regardless of length, shall be marked with indelible color-coded labels that have unique identifying number that corresponds with those found on the schematic diagrams and as-built drawings.
2. Labels shall be directly hot stamped or factory-stamped with closed sleeve method. Adhesive strip labels may only be used if protected by transparent heat-shrink tubing.
3. Marking codes used on cables shall correspond and be shown clearly on as-built drawings.
4. Provide all proposed wording and / or numbering scheme for labeling to the Consultant for review and written approval prior to procurement or installation.
5. All wall plates shall be labeled with Input and Output identifications and referenced to corresponding operational software or hardware it serves.
6. All labels used must be permanent and secure. Provide labeling as follows unless otherwise noted in a specific section:
    a. Provide engraved Lamacoid labels at the front of all equipment mounted in the racks. Labels shall indicate equipment type and model number and correspond to the As-Built drawings for equipment identification.

b. Mount labels on the equipment rack, not on the equipment, and attach in a neat, plumb, and permanent manner. The labels shall be placed on the equipment rack vertical frame (post). If the equipment rack vertical posts have a recessed mid-section, then match label width to fit this recessed section.

c. Labels shall be uniform in size. All adjacent labels shall be sized to match the other labels used for same purpose. Similarly, provide engraved labels of like size in other locations.

d. Provide engraved Lamacoid labels on each equipment rack rear door or console rear panel reading "No user serviceable parts. Refer service to qualified technician."

e. Embossed adhesive labels are not acceptable.

f. All label lettering shall be a minimum of .08" high. Embossed adhesive labels are not acceptable.

g. Position at the left side front top rack space of each equipment cabinet a label that states the name of system Installer with contact information and at the right side a label that states the Design Consultant with contact information.

h. Unless otherwise noted, labels on dark panels shall be black with white letters. Labels on stainless steel or brushed natural aluminum plates or light colored panels shall be white with black lettering.

i. All wall plates shall have input and output connectors labeled in a professional and permanent manner, no hand written labels shall be accepted.

j. Cable and Jack labels shall include room identification with unique cable number, jack location within the room, and MER or TR number.

k. The Contractor shall use actual room identifications in their labeling scheme. Contractor shall obtain written approval from the Owner for the actual room numbers, and labeling scheme, to be used prior to installation.

l. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked in a manner approved by the Consultant.

m. Custom panel nomenclature shall be engraved, etched, or screened. Markings for these items are purposely detailed in the construction drawings to ensure consistency and clarity. Verify markings and placement with the Consultant prior to procurement. Submit label sample layouts for Project Consultant’s review.

n. All terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled in a manner acceptable to the Consultant.

o. All labeling information shall appear on the As-Built drawings as device and equipment cross-reference identifier and servicing aids.

E. Connections and Connectors

1. Connections shall be made with approved connectors on cables, terminal blocks, or punch blocks. Crimp style connectors shall be made with proper crimping tool. Two point crimps will not be accepted.

2. RF cable connectors shall be made with hex crimp.

3. Cables shall be terminated with the proper connector specifically produced for use with each type of cable.

4. Video connectors that are not of solder type (HDMI, BNC, RCA, F, etc.) shall be terminated using a crimp tool or dies designed specifically for the connectors being applied.

5. XLR type connectors shall be wired with pin 2 high, pin 3 low, and pin 1 shield.

6. Mechanical connectors must be specially made for type of cable or wire used.

7. Connector adapters will not be allowed in any part of the system.

8. Twist on connectors shall not be allowed.

9. Solder joints will be made with rosin-core solder.

F. Interconnection

1. Contractor shall make all system interconnections as necessary, as indicated on the Drawings, or specified herein.

2. Contractor shall provide power and control cables to and from power supplies, remotely controlled equipment and other devices even though such cables are not explicitly indicated on Drawings or listed in equipment tables.

G. Cable Management

1. Cabling located above ceilings shall be tied off to and supported with cable hangers fastened directly to the structure.
2. Where a cable is installed inside desk or other furniture, a means of protecting the cables and holding cabling to a fixed surface shall be provided.
3. Holes in horizontal furniture surfaces for cable pass-through shall be provided with appropriate sized grommet. Grommet shall be black unless otherwise specified.
4. Provide Service Loops with ample cable at each termination so that plates, panels, and equipment can be removed for service, re-termination or inspection. Provide the following as a minimum:
    a. Wall plate outlet box: minimum of ten (10) inches from wall surface to jack.
    b. Termination panel: Six (6) inches behind termination panel from cable tie to jack.

H. Equipment Racks

1. Install all rack-mounted equipment using steel 10-32 machine screws with Phillips large oval heads or Allen head drives. Screws must have a black oxide finish, and plastic cup washers to protect the equipment panel finish.
2. Provide wire and cable management at the front of equipment and wire and cable support bars at the rear of equipment. Support bars will be used to tie cables for strain relief before connection to the accompanying equipment. Provide sufficient service loops between support bars and equipment.
3. Unused open front rack spaces in equipment racks must be filled with black rack blank spacers (not vents). Equipment rack vents shall only be used at top and bottom of the rack.
4. Place all rack devices requiring adjustments, cleaning, or similar attention so that they will be accessible for such attention.
5. Equipment racks shall be positioned to permit full access for operation and service. This means clearance for door swing and service technician at both front and back of equipment rack.
6. Equipment racks and sensitive components shall be placed so that signals will not be contaminated by induced electromagnetic and electrostatic noise from other electrical devices.
7. All wire and cable to and from the equipment racks shall run across the top of the racks on a ladder cable tray mounted with standoffs from the equipment rack or hung below the ceiling.
8. As a general practice, all power cables, control cables, and high level cables shall be grouped to one side of the equipment rack while low-level cables are on the other side.

3.3 CONSTRUCTION

A. Required typical system mockups

1. The Contractor shall build typical mockups as required and complete in detail for review by the Owner and Consultant prior to their final equipment install in the rest of the facility. Once reviewed and accepted, this mockup shall be the approved configuration model to install in the remaining locations. Mockups for this project include but are not limited to the following:
    a. Video Monitor at Dais Table complete with mounting arm
    b. New 4.3” Touch Panels and existing multi-button panels placed on FSR DSKB series tabletop boxes
    c. Proposed changes to Touch Panel pages of the Crestron Control System

B. Special Techniques

1. Network Devices
    a. Coordinate with the Owner’s IT staff the assigned data port numbers for use with any Network Devices of the system.
    b. Most of the Data Network system devices (black boxes) that makeup the IP signal platform are what is commonly called “Network Appliances”. Each box will likely require a data network port number and IP; the Contractor shall coordinate with the Owner and configure the following:
        i. Device IP Address
        ii. Network Subnet Mask
        iii. Default Gateway

c. V-LANs are required for control system data traffic and will require coordination with the Owner's IT staff.

2. The Contractor installing infrared devices shall be aware of other infrared devices and infrared interference in the facility and take whatever precautions necessary to avoid this causing problem to other equipment operations. For example, cover all IR receiver sensors.

3. The Contractor installing any RF devices shall be aware that RF devices may cause interference to the equipment and take whatever precautions necessary to avoid causing interference.

3.4 PROTECTION AND CLEANING

A. Equipment

1. The Contractor shall coordinate with other trades to provide an acceptable environment for installed equipment. For example, provide a dust free environment for VCRs, laser disk players, CD players, etc.

2. Cover installed equipment racks for protection during high dust periods.

3. Do not operate equipment with fans during high dust periods of the installation.

4. Coil and protect cabling from damage prior to termination to equipment

B. Prior to system turnover to Owner:

1. Remove all dirt and debris from equipment racks and equipment rooms.

2. Clean all equipment filters, vents, and fans.

3. Clean all enclosures and back box interiors thoroughly before installing plates, panels, or covers.

3.5 CLOSE OUT & QUALITY CONTROL

A. The Contractor will not receive written acceptance of work and materials until the Contractor provides written release of lien to the Owner.

B. The following should be complete and in place before final system inspection & demonstration is scheduled and performed with the Owner's Consultant:

1. Provide written detailed substantial completion reports of system testing

2. Dust, debris, solder splatter, etc. is removed

3. Cables are dressed, routed, and labeled with heat-shrink tubing over label at ends

4. Connections are confirmed consistent with regard to polarity

5. Equipment operation tested and operating normally

6. Equipment software is installed and configured

7. Electronic devices are properly grounded

8. Devices requiring AC Power are Powered and from the proper circuit

9. Test each AC power receptacle for proper hot, neutral and ground connections

10. Interconnecting patch cables and jumpers are in place

11. The system documentation is complete with "as- built" drawings available

12. To the best of the Contractor's knowledge, all contractual system specifications are fully met, in detail and intent.

C. TESTING & ADJUSTING

1. The Contractor will be responsible for adjusting the installed system and notifying the Consultant when system adjustments have been completed:

a. In accordance with Construction Documents

b. As required, to provide the Owner a fully functional system at system turnover

c. As directed by the Consultant

2. Audio System Equalization

a. Using a Real-Time audio frequency spectrum analyzer, such as Audio Control SA-3052 or equivalent, with both 1/3 band and narrow band display, equalize all loudspeaker systems to provide a suitable frequency response as follows:

i. Flat from 60 Hz to 2 kHz + or – 1-1/2db with a 1db per 1/3 octave roll off after 2K

ii. Load and save the final normal settings in the DSP as preset one and record same settings including system gain and amplifier level settings in the As-Built Project Manual

3. Notification: When above tests have been completed and system is ready for inspection, notify Consultant in writing at least seven working days prior to inspection. Include in this notice copies of all data recorded, date each test was completed and results of each test. All test data shall be available during inspection process.

3.6 DEMONSTRATION

A. The final acceptance, with proof of performance and operational verifications for the installed Audio & Video Systems shall be the responsibility of and performed by the Contractor in the presence of the Consultant and Owner's representative.

B. Final acceptance shall be in accordance with Construction Documents, General Conditions, and Division 27 Technology General Requirements.

C. The Contractor shall notify the Consultant 10 day’s prior substantial completion and intended schedule for the final acceptance walkthrough demonstration.

D. Acceptance Testing shall include, but not be limited to the following:

1. Demonstration of all system operations to the Consultant as the Owner’s representative.

2. A minimum of two (2) installation technicians provided by the Contractor to assist the project Consultant, as required, during final test verification and final acceptance demonstration.

3. The technicians shall be equipped to perform necessary corrections to the system. They Contractor shall provide test equipment capable of testing any and all parts of the equipment, cabling, or systems.

4. The minimum required test equipment shall include but not be limited to the following:

a. Three (3) two-way radios, that covers the area of testing, for communications between Contractor and Consultant

b. Multi test meter for reading AC / DC Voltage, Amperage, Resistance, and continuity

c. Sound level meter calibrated in db with A, C, and flat filters

d. Audio Tone Generator and audio signal tracer

e. Calibrated Pink Noise Generator

f. Real Time Audio Analyzer (RTA)

g. Audio acoustical pulse polarity / phase tester

h. Computer with installed device software and connecting cables, example DSP

5. The Contractor shall be responsible for equipment adjustments to ensure normal and proper operation. Owner required system adjustments will be made by the Contractor as directed by Owner or Project Consultant during final testing

6. During the final acceptance walkthrough the Contractor shall demonstrate operation of each major component and functional requirement as specified herein.

7. If any portion of the system does not appear to be functioning properly during the final acceptance walkthrough the Contractor shall do further test, along with corrective actions that may be immediately possible. If the need for further corrections or corrective actions does not resolve the issue the demonstration, at the Consultant’s discursion, shall be discontinued until the system operates properly.

8. The Contractor shall remain responsible for all equipment, labor, hardware and documentation, in part and in total, until Owner accepts such work or material in writing.

3.7 OWNER’S TRAINING

A. Training Requirements

1. Owner Training of the completed installation is an important part of the overall success of this project and therefor the installing Contractor shall provide comprehensive system training to the Owner as defined below and with the minimum training hours as specified.
2. Prior to scheduling or delivering Owner Training confirm the following:
    a. System as-built documentation must be provided for review to Owner and Consultant.
    b. System final walkthrough inspection must be completed.
    c. Training materials and program outline must be provided and approved by the Owner / Consultant.
    d. Training schedule must be coordinated with the Owner and Consultant.
3. Training is to include:
    a. Detailed training plan that meets approval by the Consultant and the Owner
    b. Practical and comprehensive operation of system
    c. Basic system troubleshooting techniques
    d. Digital Video file of each training session. Furnish two edited copies to the Owner.
4. Training Hours
    a. The Owner reserves the right to establish training times, duration, and training topics within the total training time allotted. Training Session Blocks can, at the Owner's request, be combined in any combination
    b. Training time shall be defined as those hours specifically set-aside for the sole purpose of training Owner's personnel. Credited time shall not be given for time spent providing instructions to the Owner's staff for a system not completed or that has not passed final acceptance by the Owner and Consultant, or training performed outside of the approved training plan.
    c. The Contractor shall issue a certificate of training completion to the trainees, upon completion of their training. Both the trainer and trainee(s) must sign the certificate before Contractor shall receive final payment.
    d. The Contractor shall provide a minimum of (8) eight hours of Owner training. This training shall be divided into training session "Blocks" as coordinated with the Owner.
5. Training sessions shall cover at a minimum:
    a. Basic System Configuration and Operation Knowledge
    b. Advance System Configuration and Operation Knowledge
    c. Typical system usage
    d. Typical User troubleshooting skills
    e. Service and maintenance requirements
6. The Owner reserves the right to establish training times, duration, and topics

END OF SECTION

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Section 31 00 00 – Civil Standard Specifications

STANDARD SPECIFICATIONS:
ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION
NOVEMBER 1, 2014
STANDARD SPECIFICATIONS ARE INCORPORATED
INTO THE CONTRACT BY REFERENCE.

Special Note: Specifications listed below are based on TxDOT Standard Specifications. Any reference to the 'Department' shall be replaced with the 'County'. All testing shown in the specifications below shall be performed by the contractor at his entire expense unless otherwise indicated by the County.

TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS

ITEM 104 - REMOVING CONCRETE

104.1. Description. Break, remove, and salvage or dispose of existing hydraulic cement concrete.

104.2. Construction. Remove existing hydraulic cement concrete from locations shown on the plans. Avoid damaging concrete that will remain in place. Saw-cut and remove the existing concrete to neat lines. Replace any concrete damaged by the Contractor at no expense to the Department.

Unless otherwise shown on the plans, accept ownership and properly dispose of broken concrete in accordance with federal, state, and local regulations.

104.3. Measurement. Removing concrete pavement, floors, porches, patios, riprap, medians, foundations, sidewalks, driveways, and other appurtenances will be measured by the square yard (regardless of thickness) or by the cubic yard of calculated volume, in its original position. Removing curb, curb and gutter, and concrete traffic barrier will be measured by the foot in its original position. The removal of monolithic concrete curb or dowelled concrete curb will be included in the concrete pavement measurement.

Removing retaining walls will be measured by the square yard along the front face from the top of the wall to the top of the footing. This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2, "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

104.4. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Removing Concrete" of the type specified. This price is full compensation for breaking the concrete; loading, hauling and salvaging or disposing of the material; and equipment, labor, tools, and incidentals. Removing retaining wall footings will not be paid for directly, but will be considered subsidiary to this Item.

ITEM 110 - EXCAVATION

110.1. Description. Excavate areas as shown on the plans or as directed. Remove materials encountered to the lines, grades, and typical sections shown on the plans and cross-sections.

110.2. Construction. Accept ownership of unsuitable or excess material and dispose of material in accordance with local, state, and federal regulations at locations outside the right of way.

Maintain drainage in the excavated area to avoid damage to the roadway section. Correct any damage to the subgrade caused by weather, at no additional cost to the Department.

Shape slopes to avoid loosening material below or outside the proposed grades. Remove and dispose of slides as directed.

A. Rock Cuts. Excavate to finish subgrade. Manipulate and compact subgrade in accordance with Article 132.3.D, “Compaction Methods,” unless excavation is to clean homogenous rock at finish subgrade elevation. If excavation extends below finish subgrade, use approved embankment material compacted in accordance with Article 132.3.D to replace undercut material at no additional cost.

B. Earth Cuts. Excavate to finish subgrade. In areas where base or pavement structure will be placed on subgrade, scarify subgrade to a uniform depth at least 6 in. below finish subgrade elevation.

Manipulate and compact subgrade in accordance with Article 132.3.D, “Compaction Methods.”

If unsuitable material is encountered below subgrade elevations, take corrective measures as directed. Drying required deeper than 6 in. below subgrade elevation will be paid for in accordance with Article 9.4, “Payment for Extra Work.” Excavation and replacement of unsuitable material below subgrade elevations will be performed and paid for in accordance with the applicable bid items. However, if Item 132, “Embankment,” is not included in the Contract, payment for replacement of unsuitable material will be paid for in accordance with Article 9.4.

C. Subgrade Tolerances. For turnkey construction, excavate to within 1/2 in. in cross-section and 1/2 in. in 16 ft. measured longitudinally. For staged construction, excavate to within 0.1 ft. in cross-section and 0.1 ft. in 16 ft. measured longitudinally.

110.3. Measurement. This Item will be measured by the cubic yard in its original position as computed by the method of average end areas.This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2, “Plans Quantity Measurement.” Additional measurements or calculations will be made if adjustments of quantities are required.

Limits of measurement for excavation in retaining wall areas will be as shown on the plans.

Shrinkage or swelling factors will not be considered in determining the calculated quantities.

110.4. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Excavation (Roadway),”

“Excavation (Channel),” “Excavation (Special),” or “Excavation (Roadway and Channel).” This price is full compensation for authorized excavation; drying; undercutting subgrade and reworking or replacing the undercut material in rock cuts; hauling; disposal of material not used elsewhere on the project; scarification and compaction; and equipment, labor, materials, tools, and incidentals.

When a slide not due to the Contractor’s negligence or operation occurs, payments for removal and disposal of the slide material will be in accordance with Article 9.4, “Payment for Extra Work.” Excavation in backfill areas of retaining walls will not be measured or paid for directly but will be subsidiary to pertinent Items.

ITEM 150 - BLADING

150.1. Description. Blade portions of the project limits as shown on the plans or as directed.

150.2. Equipment. Provide equipment able to effectively produce the desired results. When work is measured and paid by the number of hours of blading, use a dual or four-wheel drive power maintainer equipped with pneumatic tires, a blade of at least 12 ft. in length, and a wheelbase of not less than 16 ft. If the maintainer is not equipped with a scarifier attachment, provide a scarifier.

150.3. Construction. Blade all areas to the section, line and grade shown on the plans. Use a scarifier when necessary to loosen materials prior to blading. Use hand methods or other means around structures, trees, and other obstructions if doing the work with a blade is impractical. Do not drag, push, or scrape material along or across completed pavement.

150.4. Measurement. This Item will be measured by the 100-foot station, along the base line of each roadbed or by the number of hours of blading, including scarifying, performed. Roadbed is defined in Item 1, “Definition of Terms.”

150.5. Payment. The work performed in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Blading.” This price is full compensation for furnishing and operating equipment and for labor, materials, tools, and incidentals.

Work done by hand labor methods adjacent to structures, trees, and other obstructions is not paid for directly, but will be considered subsidiary to this Item. Work performed under this Item will not include work specified for payment under other Items.

ITEM 154 - SCRAPER WORK

154.1. Description. Excavate, remove, utilize, or dispose of materials with a scraper. Construct, shape, and rough in earthwork in conformity with the required lines, grades, and typical sections as shown on the plans, or as directed.

154.2. Equipment. Use a scraper with a minimum 7.5-cu. yd. flush capacity. Provide a scraper capable of self-loading, or provide power equipment for the scraper to load to capacity. A scraper unit consists of the scraper and any power units necessary.

154.3. Construction. Perform “Scraper Work” on the areas shown on the plans or as directed. Use suitable excavated materials, including topsoil, for constructing the required roadway sections. Compact embankment in accordance with methods shown on the plans and as outlined in Article 132.3, “Construction.” All excavated material becomes the property of the Contractor, unless otherwise shown on the plans. Properly dispose of excess excavated material in accordance with federal, state, and local requirements at locations outside the right of way.

Where plans designate “Scraper Work” and either “Blading” or “Road Grader Work” within the same limits, rough in with “Scraper Work.” Finish in accordance with Item 150, “Blading,” or Item 152, “Road Grader Work.”

154.4. Measurement. This Item will be measured by the cubic yard hour. A scraper unit cubic yard hour is the flush capacity of the scraper in cubic yards or 70% of the manufacturer’s heaped capacity, whichever is less, multiplied by the actual number of hours of scraper work performed.

154.5. Payment. The work performed in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Scraper Work (Ordinary Compaction)” or “Scraper Work (Density Control).” This price is full compensation for equipment, material removal and disposal, hauling, labor, materials, tools, and incidentals.

“Sprinkling” and “Rolling” will not be paid for directly, but will be subsidiary to this Item. The work performed under this Item will not include work specified for payment under other Items.

ITEM 156 - BULLDOZER WORK

156.1. Description. Excavate, remove, utilize, or dispose of materials with a bulldozer. Construct, shape, and finish earthwork in conformity with the required lines, grades, and typical cross sections as shown on the plans, or as directed.

156.2. Equipment. Use a tractor, crawler or rubber tired type, with a blade attachment. Use a scarifier or ripper with the required tractor when necessary. The blade attachment must be at least 8 ft. long. Use equipment of the type specified on the plans, meeting the following requirements:

A. Type A. Manufacturer's rated net flywheel power of less than 150 horsepower based on SAE standard J1349.

B. Type B. Manufacturer's rated net flywheel power of 150 or greater horsepower based on SAE standard J1349.

156.3. Construction. Perform bulldozer work on the areas as specified on the plans, utilizing equipment as specified above. Where plans designate "Bulldozer Work" and "Blading," or "Road Grader Work," within the same limits, rough in with bulldozer work. Finish in accordance with specifications for "Blading" or "Road Grader Work." Compact embankment to ordinary compaction in accordance with Item 132,

"Embankment," unless otherwise shown on the plans.

156.4. Measurement. This Item will be measured by the actual number of hours of use of the specified type of equipment operated.

156.5. Payment. The work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Bulldozer Work." This price is full compensation for furnishing and operating equipment, labor, materials, tools, and incidentals.

"Sprinkling" and "Rolling" will not be paid for directly, but will be subsidiary to this Item. Work performed under this Item will not include work specified for payment under other Items.

ITEM 160 - TOPSOIL

160.1. Description. Furnish and place topsoil to the depths and on the areas shown on the plans.

160.2. Materials. Use easily cultivated, fertile topsoil that is free from objectionable material, has a high resistance to erosion, and is able to support plant growth. Obtain topsoil from the right of way at sites of proposed excavation or embankment when specified on the plans, or as directed. Secure additional topsoil, if necessary, from approved sources outside the right of way in accordance with the requirements of Article 7.19, "Preservation of Cultural and Natural Resources and the Environment." Ensure that the topsoil obtained from sites outside the right of way has a pH of 5.5 to 8.5. Topsoil is subject to testing by the Engineer.

Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

160.3. Construction. Remove and dispose of objectionable material from the topsoil source before beginning the work. Stockpile topsoil, when necessary, in a windrow at designated locations along the right of way line or as directed. Keep source and stockpile areas drained during the period of topsoil removal and leave them in a neat condition when removal is complete. Before placing topsoil, cultivate the area to a depth of 4 in.

Spread the topsoil to a uniform loose cover at the thickness specified. Place and shape the topsoil as directed. Water and roll the topsoil with a light roller or other suitable equipment.

160.4. Measurement. This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard complete in place, or by the cubic yard in vehicles at the point of delivery.

160.5. Payment. The work performed and the materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Furnishing and Placing Topsoil” of the depth specified on the plans (except for measurement by the cubic yard).

This price is full compensation for securing necessary sources and royalties; furnishing topsoil; excavation, loading, hauling, stockpiling and placing; watering; rolling; and equipment, labor, materials, tools, and incidentals.

Limits of excavation and embankment for payment are shown in Figure 1.

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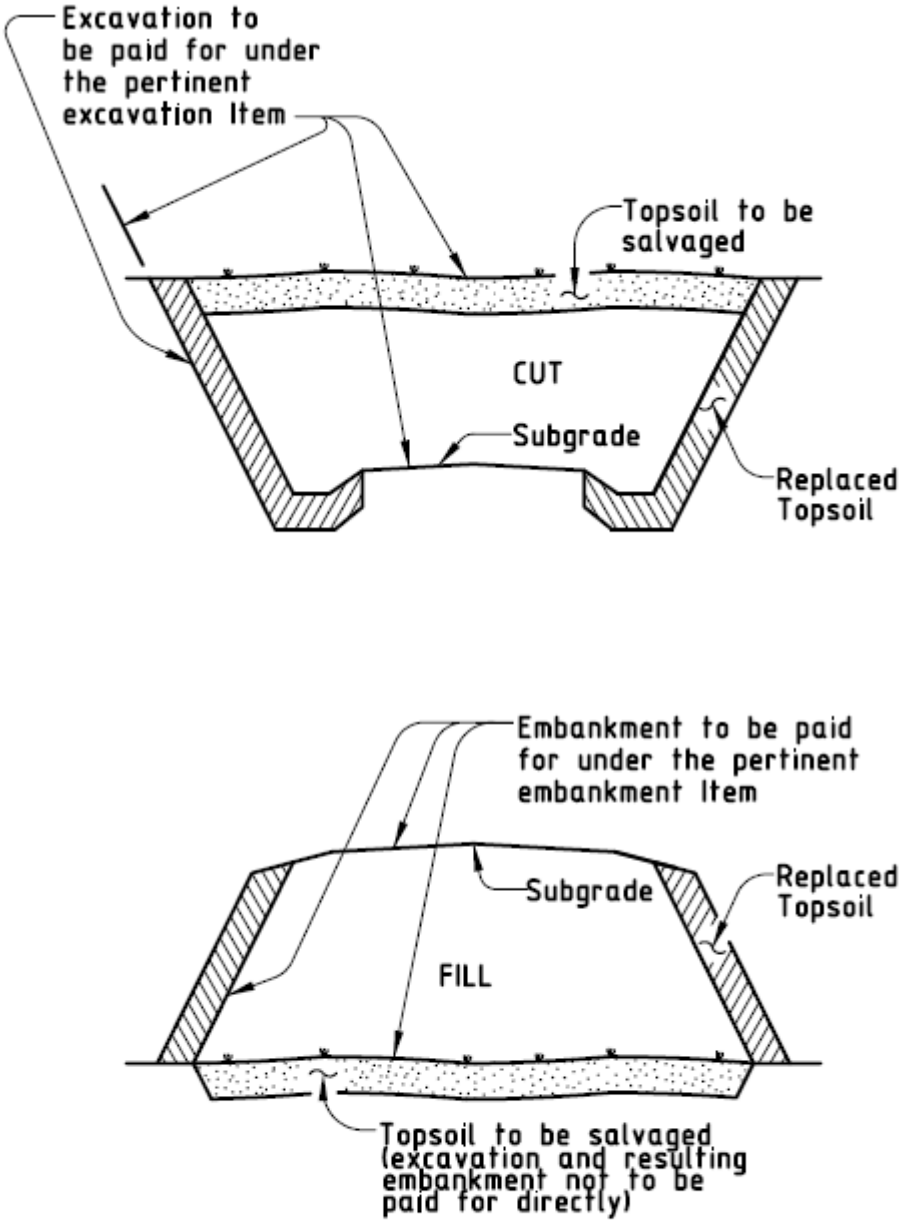

Figure 1
Roadway cross sections showing payment for excavation and embankment.

ITEM 164 - SEEDING FOR EROSION CONTROL

164.1. Description. Provide and install temporary or permanent seeding for erosion control as shown on the plans or as directed.

164.2. Materials.

A. Seed. Provide seed from the previous season's crop meeting the requirements of the Texas Seed Law, including the testing and labeling for pure live seed (PLS = Purity x Germination). Furnish seed of the designated species, in labeled unopened bags or containers to the

Engineer before planting. Use within 12 mo. From the date of the analysis. When Buffalograss is specified, use seed that is treated with KNO3 (potassium nitrate) to overcome dormancy.

Use Tables 1 through 4 to determine the appropriate seed mix and rates as specified on the plans.

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Table 1
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
1 (Paris) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.2	Bermudagrass	1.5
	Bermudagrass	1.8	Bahiagrass (Pensacola)	6.0
	Little Bluestem (Native)	1.7	Sand Lovegrass	0.6
	Illinois Bundleflower	1.0	Weeping Lovegrass (Ermelo)	0.8
			Partridge Pea	1.0
2 (Ft. Worth) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Sand Lovegrass	0.5
	Bermudagrass	0.9	Bermudagrass	1.8
	Little Bluestem (Native)	1.0	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.4
	Illinois Bundleflower	1.0	Partridge Pearl	1.0
3 (Wichita Falls) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Bermudagrass	1.2
	Bermudagrass	0.9	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Sand Bluestem	2.4
	Western Wheatgrass	2.1	Sand Lovegrass	0.3
	Blue Grama (Hachita)	0.6	Weeping Lovegrass (Ermelo)	0.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
4 (Amarillo) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairieclover	0.5
5 (Lubbock) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairieclover	0.5

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Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
6 (Odessa) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.3	Blue Grama	0.8
	Blue Grama (Hachita)	0.8	Sand Dropseed	0.4
	Alkali Sacaton	0.4	Weeping Lovegrass (Ermelo)	0.6
	Galleta	2.1	Indian Ricegrass	3.0
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
7 (San Angelo) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Sideoats Grama (Haskell)	2.7
	Buffalograss (Texoka)	1.6	Weeping Lovegrass (Ermelo)	0.6
	Little Bluestem (Native)	1.7	Sand Dropseed	0.4
	Blue Grama (Hachita)	0.9	Purple Prairieclover	0.5
	Galleta	1.6		
	Illinois Bundleflower	1.0		
8 (Abilene) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Sand Bluestem	3.0
	Blue Grama (Hachita)	0.9	Weeping Lovegrass (Ermelo)	1.2
	Galleta	1.6	Sand Dropseed	0.5
	Buffalograss (Texoka)	1.6	Purple Prairieclover	0.5
	Little Bluestem (Native)	1.7		
	Illinois Bundleflower	1.0		
9 (Waco) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.2	Bermudagrass	2.4
	Sideoats Grama (Haskell)	3.6	Sand Dropseed	0.5
	Little Bluestem (Native)	2.0	Weeping Lovegrass (Ermelo)	0.8
	Illinois Bundleflower	1.0	Partridge Pea	1.0
10 (Tyler) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Bermudagrass	1.8
	Bahiagrass (Pensacola)	9.0	Bahiagrass (Pensacola)	9.0
	Sideoats Grama (Haskell)	2.7	Weeping Lovegrass (Ermelo)	0.5
	Illinois Bundleflower	1.0	Sand Lovegrass	0.5
			Lance-Leaf Coreopsis	1.0

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Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
11 (Lufkin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Bermudagrass	2.1
	Bahiagrass (Pensacola)	9.0	Bahiagrass (Pensacola)	9.0
	Sideoats Grama (Haskell)	2.7	Sand Lovegrass	0.5
	Illinois Bundleflower	1.0	Lance-Leaf Coreopsis	1.0
12 (Houston) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.1	Bermudagrass	2.4
	Sideoats Grama (Haskell)	3.2	Bahiagrass (Pensacola)	10.5
	Little Bluestem (Native)	1.4	Weeping Lovegrass (Ermelo)	0.5
	Illinois Bundleflower	1.0	Lance-Leaf Coreopsis	1.0
13 (Yoakum) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	1.8
	Bermudagrass	1.8	Bahiagrass (Pensacola)	6.0
	Little Bluestem (Native)	1.4	Sand Lovegrass	0.6
	Illinois Bundleflower	1.0	Weeping Lovegrass (Ermelo)	0.6
			Partridge Pea	1.0
14 (Austin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	0.9	Bermudagrass	2.4
	Sideoats Grama (Haskell)	2.7	Weeping Lovegrass (Ermelo)	0.8
	Little Bluestem (Native)	1.0	Sand Lovegrass	0.8
	Blue Grama (Hachita)	0.9	Partridge Pea	1.0
	Illinois Bundleflower	1.0		
15 (San Antonio) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.2	Bermudagrass	1.8
	Sideoats Grama (Haskell)	2.7	Lehmanns Lovegrass	0.6
	Little Bluestem (Native)	1.4	Sand Lovegrass	0.6
	Plains Bristlegrass	1.2	Buffelgrass (Common)	0.4
	Illinois Bundleflower	1.0	Partridge Pea	1.0
16 (Corpus Christi) Jan. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Bermudagrass	1.8
	Bermudagrass	1.8	Buffelgrass (Common)	0.4
	Buffalograss (Texoka)	1.6	Sand Lovegrass	0.6
	Plains Bristlegrass	1.2	Lehmanns Lovegrass	0.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5

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Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
17 (Bryan) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.5	Bermudagrass	1.5
	Sideoats Grama (Haskell)	3.6	Bahiagrass (Pensacola)	7.5
	Little Bluestem (Native)	1.7	Weeping Lovegrass (Ermelo)	0.6
	Illinois Bundleflower	1.0	Sand Lovegrass	0.6
			Lance-Leaf Coreopsis	1.0
18 (Dallas) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.2	Bermudagrass	1.8
	Sideoats Grama (El Reno)	2.7	Weeping Lovegrass (Ermelo)	0.6
	Little Bluestem (Native)	2.0	Sand Lovegrass	0.6
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
	Illinois Bundleflower	1.0	Partridge Pea	1.0
19 (Atlanta) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	2.1
	Sideoats Grama (Haskell)	4.5	Bahiagrass (Pensacola)	7.5
	Illinois Bundleflower	1.0	Sand Lovegrass	0.6
			Lance-Leaf Coreopsis	1.0
20 (Beaumont) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.7	Bermudagrass	2.1
	Sideoats Grama (Haskell)	4.1	Bahiagrass (Pensacola)	7.5
	Illinois Bundleflower	1.0	Sand Lovegrass	0.6
			Lance-Leaf Coreopsis	1.0
21 (Pharr) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	1.8
	Plains Bristlegrass	1.2	Buffelgrass (Common)	0.4
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
	Bermudagrass	1.2	Lehmanns Lovegrass	0.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
22 (Laredo) Jan. 15 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	1.8
	Bermudagrass	1.2	Buffelgrass (Common)	0.4
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
	Plains Bristlegrass	1.2	Lehmanns Lovegrass	0.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
23 (Brownwood) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Bermudagrass	1.8
	Bermudagrass	0.6	Weeping Lovegrass (Ermelo)	0.6
	Blue Grama (Hachita)	0.9	Sand Lovegrass	0.6
	Galleta	2.1	Sand Dropseed	0.4
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
24 (El Paso) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Butte)	2.7	Sand Dropseed	0.4
	Blue Grama (Hachita)	0.9	Lehmanns Lovegrass	0.9
	Galleta	2.1	Blue Grama (Hachita)	1.0
	Alkali Sacaton	0.4	Indian Ricegrass	1.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
25 (Childress) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Weeping Lovegrass (Ermelo)	1.2
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.5
	Western Wheatgrass	2.1	Sand Lovegrass	0.8
	Galleta	1.6	Purple Prairieclover	0.5
	Illinois Bundleflower	1.0		

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Table 2
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
1 (Paris) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
2 (Ft. Worth) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	3.6
	Bermudagrass	2.4	Bermudagrass	2.1
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
3 (Wichita Falls) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	4.5	Sideoats Grama (El Reno)	3.6
	Bermudagrass	1.8	Bermudagrass	1.8
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
4 (Amarillo) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
			Buffalograss (Texoka)	1.6
5 (Lubbock) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
			Buffalograss (Texoka)	1.6
6 (Odessa) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Sideoats Grama (Haskell)	2.7
	Blue Grama (Hachita)	1.2	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6
7 (San Angelo) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	7.2	Sideoats Grama (Haskell)	3.2
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
			Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6

Table 2 (continued)
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
8 (Abilene) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Sand Dropseed	0.3
	Blue Grama (Hachita)	1.2	Sideoats Grama (Haskell)	3.6
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	0.8
			Buffalograss (Texoka)	1.6
9 (Waco) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Sideoats Grama (Haskell)	4.5	Sand Dropseed	0.4
10 (Tyler) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
11 (Lufkin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
12 (Houston) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	4.5	Bermudagrass	5.4
	Bermudagrass	2.4		
13 (Yoakum) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	4.5	Bermudagrass	5.4
	Bermudagrass	2.4		
14 (Austin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	4.8
	Sideoats Grama (Haskell)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		
15 (San Antonio) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	4.8
	Bermudagrass	2.4	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		
16 (Corpus Christi) Jan. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	4.8
	Bermudagrass	2.4	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		

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Table 2 (continued)
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
17 (Bryan) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
18 (Dallas) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	2.4	Sand Dropseed	0.4
19 (Atlanta) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
20 (Beaumont) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
21 (Pharr) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	2.4	Sand Dropseed	0.4
22 (Laredo) Jan. 15 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	4.5	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	1.8	Sand Dropseed	0.4
23 (Brownwood) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Buffalograss (Texoka)	1.6
	Bermudagrass	1.2	Bermudagrass	3.6
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.4
24 (El Paso) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Butte)	3.6	Buffalograss (Texoka)	1.6
	Blue Grama (Hachita)	1.2	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	1.8
25 (Childress) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sand Dropseed	0.4
	Blue Grama (Hachita)	1.2	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	1.8

Table 3
Temporary Cool Season Seeding

Districts	Dates	Seed Mix and Rates (lb./ac.)	
Paris (1), Amarillo (4), Lubbock (5), Dallas (18)	September 1 – November 30	Tall Fescue Western Wheatgrass Wheat (Red, Winter)	4.5 5.6 34
Odessa (6), San Angelo (7), El Paso (24)	September 1 – November 30	Western Wheatgrass Wheat (Red, Winter)	8.4 50
Waco (9), Tyler (10), Lufkin (11), Austin (14), San Antonio (15), Bryan (17), Atlanta (19)	September 1 – November 30	Tall Fescue Oats Wheat	4.5 24 34
Houston (12), Yoakum (13), Corpus Christi (16), Beaumont (20), Pharr (21), Laredo (22)	September 1 – November 30	Oats	72
Ft. Worth (2), Wichita Falls (3), Abilene (8), Brownwood (23), Childress (25)	September 1 – November 30	Tall Fescue Western Wheatgrass Cereal Rye	4.5 5.6 34

Table 4
Temporary Warm Season Seeding

Districts	Dates	Seed Mix and Rates (lb./ac.)	
All	May 1 – August 31	Foxtail Millet	34

B. Fertilizer. Use fertilizer in conformance with Article 166.2, “Materials.”

C. Vegetative Watering. Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

D. Mulch.

1. Straw or Hay Mulch. Use straw or hay mulch in conformance with Article 162.2.E, “Mulch.”

2. Cellulose Fiber Mulch. Use only cellulose fiber mulches that are on the approved list published in “Field Performance of Erosion Control Products,” available from the Maintenance Division. Submit 1 full set of manufacturer’s literature for the selected material. Keep mulch dry until applied. Do not use molded or rotted material.

E. Tacking Methods. Use a tacking agent applied in accordance with the manufacturer’s recommendations or a crimping method on all straw or hay mulch operations. Tacking agents must be approved before use, or specified on the plans.

164.3. Construction. Cultivate the area to a depth of 4 in. before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 in. or mow the area before placement of the permanent seed. Plant the seed specified and mulch, if required, after the area has been completed to lines and grades as shown on the plans.

A. Broadcast Seeding. Distribute the seed or seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution or hydro-seeding on top of the soil. When seed and water are to be distributed as a slurry during hydro-seeding, apply the mixture to the area to be seeded within 30 min. of placement of components in the equipment. Roll the planted area with a light roller or other suitable equipment. Roll sloped areas along the contour of the slopes.

B. Straw or Hay Mulch Seeding. Plant seed according to Section 164.3.A, “Broadcast Seeding.” Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

C. Cellulose Fiber Mulch Seeding. Plant seed according to Section 164.3.A, “Broadcast Seeding.” Immediately after planting the seed or seed mixture, apply cellulose fiber mulch uniformly over the seeded area at the following rates:

• Sandy Soils with slopes of 3:1 or less—2500 lb. per acre.

• Sandy Soils with slopes greater than 3:1—3000 lb. per acre.

• Clay Soils with slopes of 3:1 or less—2000 lb. per acre.

• Clay Soils with slopes greater than 3:1—2300 lb. per acre.

Cellulose fiber mulch rates are based on dry weight of mulch per acre.

Mix cellulose fiber mulch and water to make a slurry and apply uniformly over the seeded area using suitable equipment.

D. Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 in. using a pasture or rangeland type drill. Plant seed along the contour of the slopes.

E. Straw or Hay Mulching. Apply straw or hay mulch uniformly over the area as indicated on the plans. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

Apply fertilizer in conformance with Article 166.3, “Construction.” Seed and fertilizer may be distributed simultaneously during “Broadcast Seeding” operations, provided each component is applied at the specified rate. When temporary and permanent seeding are both specified for the same area, apply half of the required fertilizer during the temporary seeding operation and the other half during the permanent seeding operation.

Water the seeded areas at the rates and frequencies as shown on the plans or as directed.

164.4. Measurement. This Item will be measured by the square yard or by the acre.

164.5. Payment. The work performed and the materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Broadcast Seeding (Perm)” of the rural or urban seed mixture and sandy or clay soil specified, “Broadcast Seeding (Temp)” of warm or cool season specified, “Straw or Hay Mulch Seeding (Perm)” of the rural or urban seed mixture and sandy or clay soil specified, “Straw or Hay Mulch Seeding (Temp)” of warm or cool season specified, “Cellulose Fiber Mulch Seeding (Perm)” of the rural or urban seed mixture and sandy or clay soil specified, “Cellulose Fiber Mulch Seeding (Temp)” of warm or cool season specified, “Drill Seeding (Perm)” of the rural or urban seed mixture and sandy or clay soil specified, “Drill Seeding (Temp)” of warm or cool season specified, and “Straw or Hay Mulching.” This price is full compensation for furnishing materials, including water for hydro-seeding and hydro-mulching operations, mowing, labor, equipment, tools,

supplies, and incidentals. Fertilizer will not be paid for directly but will be subsidiary to this Item. Water for irrigating the seeded area, when specified, will be paid for under Item 168, “Vegetative Watering.”

ITEM 168 - VEGETATIVE WATERING

168.1. Description. Provide and distribute water to promote growth of vegetation as directed.

168.2. Materials. Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

168.3. Construction. Apply water when directed. Furnish and operate equipment to distribute water at a uniform and controllable rate. Ensure that watering does not erode soil or plantings. Apply water in the required quantity where shown on the plans or as directed.

168.4. Measurement. This Item will be measured by the 1000 gal. as applied.

168.5. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Vegetative Watering.” This price is full compensation for furnishing and operating watering equipment and measuring devices and for furnishing and applying water, including hauling, equipment, labor, and incidentals.

ITEM 204 - SPRINKLING

204.1. Description. Apply water for dust control, earthwork, or base construction.

204.2. Materials. Furnish water free of industrial wastes and other objectionable matter.

204.3. Equipment. Use sprinklers and spray bars equipped with positive and rapidly working cut-off valves.

204.4. Construction. Apply water at a uniform rate and in the required quantity, or as directed.

204.5. Measurement. This Item will be measured by the 1,000 gal. applied.

204.6. Payment. Unless sprinkling is specified as a pay item, the work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

When sprinkling is specified on the plans as a pay item, the work performed and water furnished will be paid for at the unit price bid for “Sprinkling (Base),” “Sprinkling (Earthwork),” or “Sprinkling (Dust Control).” This price is full compensation for furnishing and applying water; furnishing and operating sprinklers and measuring devices; and hauling, equipment, labor, fuel, materials, tools, and incidentals.

ITEM 210 - ROLLING

210.1. Description. Compact embankment, subgrade, base, surface treatments, broken concrete pavement, or asphalt pavement using rollers.

Break up asphalt mats, pit run material, or base materials.

210.2. Equipment. The Contractor may use any type of roller to meet the production rates and quality requirements of the Contract unless otherwise shown on the plans or directed. When specific types of

equipment are required, use equipment that meets the requirements of this Article. The Engineer may allow the use of rollers that operate in one direction only when turning does not affect the quality of work or encroach on traffic.

Table 1
Roller Requirements[1]

Roller Type	Materials to be Compacted	Load (tons)	Contact Pressure	Roller Speed (mph)
Steel wheel	Embankment, subgrade, base, asphalt concrete	≥ 10	≥ 325 lb. per linear inch of wheel width	2–3
Tamping	Embankment, subgrade, base	–	125–550 psi per tamping foot	2–3
Heavy tamping	Embankment, subgrade, base	–	≤ 550 psi per tamping foot	2–3
Vibratory	Embankment, subgrade, base, asphalt concrete	Type A < 6 Type B > 6 Type C as shown on plans	Per equipment specification and as approved	As approved
Light pneumatic	Embankment, subgrade, base, surface treatment	4.5–9.0	≥ 45 psi	2–6
	Asphalt Concrete			4–12
Medium pneumatic	Same as light pneumatic	12–25	≥ 80 psi, as directed	Same as light pneumatic
Heavy pneumatic	Embankment, subgrade, base, previously broken concrete pavement, other pavements	≥ 25	≤ 150 psi	2–6
Grid	Embankment, base, breaking up existing asphalt mats or base	5–13	–	2–3

1. Unless otherwise specified in the Contract.

A. Static Steel Wheel Rollers. Furnish single, double, or triple steel wheel, self-propelled power rollers weighing at least 10 tons capable of operating in a forward and backward motion. Ensure all wheels are flat.

When static steel wheel rollers are required, vibratory rollers in the static mode may be used.

For single steel wheel rollers, pneumatic rear wheels are allowed for embankment, subgrade, and base. For triple steel wheel rollers, provide rear wheels with a minimum diameter of 48 in., a minimum width of 20 in., and a minimum compression of 325 lb. per inch of wheel width.

B. Tamping Rollers. Furnish self-propelled rollers with at least 1 selfcleaning metal tamping drum capable of operating in a forward or backward motion with a minimum effective rolling width of 5 ft. For rollers with more than 1 drum, mount drums in a frame so that each drum moves independently of the other. Operate rollers in static or vibratory mode.

1. Tamping Roller (Minimum Requirement). For all tamping rollers except for heavy tamping rollers, provide tamping feet that exert a static load of 125 to 550 psi and project at least 3 in. from the surface of the drum.

2. Heavy Tamping Roller. Provide tamping rollers that have:

• 2 metal tamping drums, rolls, or shells, each with a 60-in. minimum diameter and a 5-ft. minimum width, or

• 1 rear and 2 forward drums, each with a 60-in. minimum diameter. Arrange drums so that the rear drum compacts the space between the 2 forward drums and the minimum overall rolling width is 10 ft.

Equip drums with tamping feet that:

• project at least 7 in. from the drum surface,

• have an area of 7 to 21 sq. in.,

• are self-cleaning,

• exert a static load of at least 550 psi, and

• are spaced at 1 tamping foot per 0.65 to 0.70 sq. ft. of drum area.

C. Vibratory Rollers. Furnish self-propelled rollers with at least 1 drum equipped to vibrate. Select and maintain amplitude and frequency settings per manufacturer's specifications to deliver maximum compaction without material displacement or shoving, as approved.

Furnish the equipment manufacturer's specifications concerning settings and controls for amplitude and frequency. Operate rollers at speeds that will produce at least 10 blows per foot unless otherwise shown on the plans or approved. Pneumatic rear wheels are allowed for embankment, subgrade, and base. Equip each vibrating drum with:

• separate frequency and amplitude controls,

• controls to manually start and stop vibration, and

• a mechanism to continuously clean the face of the drum.

For asphalt-stabilized base and asphalt concrete pavement, furnish a roller that also has the ability to:

• automatically reverse the direction of the rotating eccentric weight,

• stop vibration before the motion of the roller stops, and

• thoroughly moisten the drum with water or approved asphalt release agent.

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1. Drum (Type A). Furnish a roller with a static weight less than 6 tons and a vibratory drum.

2. Drum (Type B). Furnish a roller with a minimum static weight of 6 tons and a vibratory drum.

3. Drum (Type C). Furnish a roller as shown on plans.

D. Pneumatic Tire Rollers. Pneumatic tire rollers consist of rubber tire wheels on axles mounted in a frame with either a loading platform or body suitable for ballast loading. Arrange the rear tires to cover the gaps between adjacent tires of the forward group. Furnish rollers capable of forward and backward motion. Compact asphalt pavements and surface treatments with a roller equipped with smooth-tread tires.

Compact without damaging the surface. When necessary, moisten the wheels with water or an approved asphalt release agent.

Select and maintain the operating load and tire air pressure within the range of the manufacturer's charts or tabulations to attain maximum compaction throughout the lift, as approved. Furnish the manufacturer's chart or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished. Maintain individual tire inflation pressures within 5 psi of each other. Provide uniform compression under all tires.

1. Light Pneumatic Tire. Furnish a unit:

• with at least 9 pneumatic tires,

• with an effective rolling width of approximately 5 ft.,

• capable of providing a total uniform load of 4.5 to 9 tons, and

• with tires capable of maintaining a minimum ground contact pressure of 45 psi.

2. Medium Pneumatic Tire. Furnish a unit:

• with at least 7 pneumatic tires,

• with an effective rolling width of approximately 7 ft.,

• capable of providing a total uniform load of 12 to 25 tons, and

• with tires capable of maintaining a minimum ground contact pressure of 80 psi or 90 psi as directed.

3. Heavy Pneumatic Tire. Furnish a unit:

• with at least 4 pneumatic-tired wheels mounted on axles carrying at most 2 wheels,

• with wheels arranged to carry approximately equal loads on uneven surfaces,

• with a width between 8 and 10 ft. that can turn 180° in the crown width,

• capable of providing a total uniform load of at least 25 tons,

• with tires capable of maintaining a maximum ground contact pressure of 150 psi, and

• with liquid-filled tires inflated to such a level that liquid will flow from the valve stem when the stem is in the uppermost position.

E. Grid Rollers. Furnish rollers that have 2 cylindrical cages with a minimum diameter of 66 in. and a minimum width of 32 in. Mount cages in a rigid frame with weight boxes. Use a cage surface of cast or welded steel fabric grid with bars 1-1/2 in. wide, spaced on 5-in. centers in each direction, that undulate approximately 1 in. between the high and low points.

Furnish rollers capable of providing a total load of 5 to 13 tons and capable of being operated in a forward or backward motion.

F. Alternate Equipment. Instead of the specified equipment, the Contractor may, as approved, operate other compaction equipment that produces equivalent results. Discontinue the use of the alternate equipment and furnish the specified equipment if the desired results are not achieved.

210.3. Construction. Perform this work in accordance with the applicable

Items using equipment and roller speeds specified in Table 1. Use only rubber-tired equipment to push or pull compaction equipment on base courses. Use equipment that does not damage material being rolled.

210.4. Measurement and Payment. The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but will be subsidiary to pertinent Items.

ITEM 360 - CONCRETE PAVEMENT

360.1. Description. Construct hydraulic cement concrete pavement with or without curbs on the concrete pavement.

360.2. Materials.

A. Hydraulic Cement Concrete. Provide hydraulic cement concrete in accordance with Item 421, “Hydraulic Cement Concrete,” except that strength over-design is not required. Provide Class P concrete designed to meet a minimum average flexural strength of 570 psi or a minimum average compressive strength of 3,500 psi at 7 days or a minimum average flexural strength of 680 psi or a minimum average compressive strength of 4,400 psi at 28 days. Test in accordance with Tex-448-A or Tex-418-A.

When shown on the plans or allowed, provide Class HES concrete for very early opening of small pavement areas or leave-outs to traffic.

Design Class HES to meet the requirements of Class P and a minimum average flexural strength of 400 psi or a minimum average compressive strength of 2,600 psi in 24 hr., unless other early strength and time requirements are shown on the plans or allowed. No strength overdesign is required. Type III cement is allowed for Class HES concrete.

Use Class A or P concrete for curbs that are placed separately from the pavement. Provide concrete that is workable and cohesive, possesses satisfactory finishing qualities, and conforms to the mix design and mix design slump.

B. Reinforcing Steel. Provide Grade 60 deformed steel for bar reinforcement in accordance with Item 440, “Reinforcing Steel.”

Provide approved positioning and supporting devices (baskets and chairs) capable of securing and holding the reinforcing steel in proper position before and during paving. Provide corrosion protection when shown on the plans.

1. Dowels. Provide smooth, straight dowels of the size shown on the plans, free of burrs, and conforming to the requirements of Item 440, “Reinforcing Steel.” Coat dowels with a thin film of grease or other ap-

proved de-bonding material. Provide dowel caps on the lubricated end of each dowel bar used in an expansion joint.

Provide dowel caps filled with a soft compressible material with enough range of movement to allow complete closure of the expansion joint.

2. Tie Bars. Provide straight deformed steel tie bars. Provide either multiple-piece tie bars or single-piece tie bars as shown on the plans. Provide multiple-piece tie bars composed of 2 pieces of deformed reinforcing steel with a coupling capable of developing a minimum tensile strength of 125% of the design yield strength of the deformed steel when tensile-tested in the assembled configuration. Provide a minimum length of 33 diameters of the deformed steel in each piece. Use multiple-piece tie bars from the list of "Prequalified Multiple Piece Tie Bar Producers" maintained by the Construction Division, or submit samples for testing in accordance with Tex-711-I.

C. Curing Materials. Provide Type 2 membrane curing compound conforming to DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants." Provide SS-1 emulsified asphalt conforming to Item 300, "Asphalts, Oils, and Emulsions," for concrete pavement to be overlayed with asphalt concrete under this

Contract unless otherwise shown on the plans or approved. Provide materials for other methods of curing conforming to the requirements of Item 420, "Concrete Structures."

D. Epoxy. Provide Type III epoxy in accordance with DMS-6100, "Epoxies and Adhesives," for installing all drilled-in reinforcing steel.

E. Evaporation Retardant. Provide evaporation retardant conforming to DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."

F. Joint Sealants and Fillers. Provide Class 5 or Class 8 joint-sealant materials and fillers unless otherwise shown on the plans or approved and other sealant materials of the size, shape, and type shown on the plans in accordance with DMS-6310, "Joint Sealants and Fillers."

360.3. Equipment. Furnish and maintain all equipment in good working condition. Use measuring, mixing, and delivery equipment conforming to the requirements of Item 421, "Hydraulic Cement Concrete." Obtain approval for other equipment used.

A. Placing, Consolidating, and Finishing Equipment. Provide approved self-propelled paving equipment that uniformly distributes the concrete with minimal segregation and provides a smooth machine-finished consolidated concrete pavement conforming to plan line and grade.

Provide an approved automatic grade control system on slip-forming equipment. Provide approved mechanically operated finishing floats capable of producing a uniformly smooth pavement surface.

Provide equipment capable of providing a fine, light water fog mist.

Provide mechanically operated vibratory equipment capable of adequately consolidating the concrete. Provide immersion vibrators on the paving equipment at sufficiently close intervals to provide uniform vibration and consolidation of the concrete over the entire width and depth of the pavement and in accordance with the manufacturer's recommendations. Provide immersion vibrator units that operate at a frequency in air of at least 8,000 cycles per minute. Provide enough hand-operated immersion vibrators for timely and proper consolidation of the concrete along forms, at joints and in areas not covered by other vibratory equipment. Surface vibrators may be used to supplement equipment-mounted immersion vibrators. Provide tachometers to verify the proper operation of all vibrators.

For small or irregular areas or when approved, the paving equipment described in this Section is not required.

B. Forming Equipment.

1. Pavement Forms. Provide metal side forms of sufficient crosssection, strength, and rigidity to support the paving equipment and resist the impact and vibration of the operation without visible springing or settlement. Use forms that are free from detrimental kinks, bends, or warps that could affect ride quality or alignment.

Provide flexible or curved metal or wood forms for curves of 100-ft. radius or less.

2. Curb Forms. Provide curb forms for separately placed curbs that are not slipformed that conform to the requirements of Item 529, “Concrete Curb, Gutter, and Combined Curb and Gutter.”

C. Reinforcing Steel Inserting Equipment. Provide inserting equipment that accurately inserts and positions reinforcing steel in the plastic concrete parallel to the profile grade and horizontal alignment in accordance to plan details.

D. Texturing Equipment.

1. Carpet Drag. Provide a carpet drag mounted on a work bridge or a moveable support system. Provide a single piece of carpet of sufficient transverse length to span the full width of the pavement being placed and adjustable so that a sufficient longitudinal length of carpet is in contact with the concrete being placed to produce the desired texture. Obtain approval to vary the length and width of the carpet to accommodate specific applications. Use an artificial grass-type carpet having a molded polyethylene pile face with a blade length of 5/8 in. to 1 in., a minimum weight of 70 oz. per square yard, and a strong, durable, rot-resistant backing material bonded to the facing.

2. Tining Equipment. Provide a self-propelled transverse metal tine device equipped with 4-in. to 6-in. steel tines and with crosssection approximately 1/32 in. thick by 1/12 in. wide, spaced at 1 in., center-to-center. Hand-operated tining equipment that produces an equivalent texture may be used only on small or irregularly shaped areas or, when permitted, in emergencies due to equipment breakdown.

E. Curing Equipment. Provide a self-propelled machine for applying membrane curing compound using mechanically pressurized spraying equipment with atomizing nozzles. Provide equipment and controls that maintain the required uniform rate of application over the entire paving area. Provide curing equipment that is independent of all other equipment when production rates are such that the first application of membrane curing compound cannot be accomplished immediately after texturing and after free moisture has disappeared. Hand-operated pressurized spraying equipment with atomizing nozzles may only be used on small or irregular areas or, when permitted, in emergencies due to equipment breakdown.

F. Sawing Equipment. Provide power-driven concrete saws to saw the joints shown on the plans. Provide standby power-driven concrete saws during concrete sawing operations. Provide adequate illumination for nighttime sawing.

G. Grinding Equipment. When required, provide self-propelled powered grinding equipment that is specifically designed to smooth and texture concrete pavement using circular diamond blades. Provide equipment with automatic grade control capable of grinding at least a 3-ft. width longitudinally in each pass without damaging the concrete.

H. Testing Equipment. Provide testing equipment regardless of jobcontrol testing responsibilities in accordance with Item 421, “Hydraulic Cement Concrete,” unless otherwise shown in the plans or specified.

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I. Coring Equipment. When required, provide coring equipment capable of extracting cores in accordance with the requirements of Tex-424-A.

J. Miscellaneous Equipment. Furnish both 10-ft. and 15-ft. steel or magnesium long-handled standard straightedges. Furnish enough work bridges, long enough to span the pavement, for finishing and inspection operations. Furnish date stencils to impress pavement placement dates into the fresh concrete, with numerals approximately 2 in. high by 1 in. wide by 1/4 in. deep.

360.4. Construction. Obtain approval for adjustments to plan grade-line to maintain thickness over minor subgrade or base high spots while maintaining clearances and drainage. Maintain subgrade or base in a smooth, clean, compacted condition in conformity with the required section and established grade until the pavement concrete is placed. Keep subgrade or base damp with water sufficiently in advance of placing pavement concrete. Adequately light the active work areas for all nighttime operations. Provide and maintain tools and materials to perform testing.

A. Paving and Quality Control Plan. Submit a paving and quality control plan for approval before beginning pavement construction operations. Include details of all operations in the concrete paving process, including longitudinal construction joint layout, sequencing, curing, lighting, early opening, leave-outs, sawing, inspection, testing, construction methods, other details and description of all equipment.

List certified personnel performing the testing. Submit revisions to the paving and quality control plan for approval.

B. Job-Control Testing. Unless otherwise shown on the plans, perform all fresh and hardened concrete job-control testing at the specified frequency. Provide job-control testing personnel meeting the requirements of Item 421, “Hydraulic Cement Concrete.” Provide and maintain testing equipment, including strength testing equipment at a location acceptable to the Engineer. Use of a commercial laboratory is acceptable. Maintain all testing equipment calibrated in accordance with pertinent test methods. Make strength-testing equipment available to the Engineer for verification testing.

Provide the Engineer the opportunity to witness all tests. The Engineer may require a retest if not given the opportunity to witness. Furnish a copy of all test results to the Engineer daily. Check the first few concrete loads for slump, air, and temperature on start-up production days to check for concrete conformance and consistency. Sample and prepare strength test specimens (2 specimens per test) on the first day of production and for each 3,000 sq. yd. or fraction thereof of concrete pavement thereafter. Prepare at least 1 set of strength-test specimens for each production day. Perform slump, air, and temperature tests each time strength specimens are made. Monitor concrete temperature to ensure that concrete is consistently within the temperature requirements. The Engineer will direct random job-control sampling and testing. Immediately investigate and take corrective action as approved if any Contractor test result, including tests performed for verification purposes, does not meet specification requirements.

When job-control testing by the Contractor is waived by the plans, the Engineer will perform the testing; however, this does not waive the Contractor’s responsibility for providing materials and work in accordance with this Item.

1. Job-Control Strength. Unless otherwise shown on the plans or permitted by the Engineer, use 7-day job-control concrete strength testing in accordance with Tex-448-A or Tex-418-A.

For 7-day job-control by flexural strength, use a flexural strength of 520 psi or a lower job-control strength value proven to meet a 28-day flexural strength of 680 psi as correlated in accordance with Tex-427-A. For 7-day job-control by compressive strength, use a compressive strength of 3,200 psi or a lower job-control strength value proven to meet a 28-day compressive strength of 4,400 psi as correlated in accordance with Tex-427-A.

Job control of concrete strength may be correlated to an age other than 7 days in accordance with Tex-427-A when approved. Jobcontrol strength of Class HES concrete is based on the required strength and time.

When a job-control concrete strength test value is more than 10% below the required job-control strength or when 3 consecutive jobcontrol strength values fall below the required job-control strength, investigate the strength test procedures, the quality of materials, the concrete production operations, and other possible problem areas to determine the cause. Take necessary action to correct the problem, including redesign of the concrete mix if needed. The Engineer may suspend concrete paving if the Contractor is unable to identify, document, and correct the cause of low strength test values in a timely manner. If any job-control strength is more than 15% below the required job-control strength, the Engineer will evaluate the structural adequacy of the pavements. When directed, remove and replace pavements found to be structurally inadequate at no additional cost.

2. Split-Sample Verification Testing. Perform split-sample verification testing with the Engineer on random samples taken and split by the Engineer at a rate of at least 1 for every 10 jobcontrol samples. The Engineer will evaluate the results of splitsample verification testing. Immediately investigate and take corrective action as approved when results of split-sample verification testing differ more than the allowable differences shown in Table 1, or when the average of 10 job-control strength results and the Engineer's split-sample strength result differ by more than 10%.

Table 1
Verification Testing Limits

Test Method	Allowable Differences
Temperature, Tex-422-A	2°F
Slump, Tex-415-A	1 in.
Air content, Tex-414-A or Tex-416-A	1%
Flexural strength, Tex-448-A	19%
Compressive strength, Tex-418-A	10%

C. Reinforcing Steel and Joint Assemblies. Accurately place and secure in position all reinforcing steel as shown on the plans. Place dowels at mid-depth of the pavement slab, parallel to the surface. Place dowels for transverse contraction joints parallel to the pavement edge.

Tolerances for location and alignment of dowels will be shown on the plans. Stagger the longitudinal reinforcement splices to avoid having more than 1/3 of the splices within a 2-ft. longitudinal length of each lane of the pavement. Use multiple-piece tie bars or drill and epoxy grout tie bars at longitudinal construction joints. Verify that tie bars that are drilled and epoxied into concrete at longitudinal construction joints develop a pullout resistance equal to a minimum of 3/4 of the yield strength of the steel after 7 days. Test 15 bars using ASTM E 488, except that alternate approved equipment may be used. All 15 tested bars must meet the required pullout strength. If any of the test results do not meet the required minimum pullout strength, perform corrective measures to provide equivalent pullout resistance. Repair damage from testing. Acceptable corrective measures include but are not limited to installation of additional or longer tie bars.

1. Manual Placement. Secure reinforcing bars at alternate intersections with wire ties or locking support chairs. Tie all splices with wire.

2. Mechanical Placement. If mechanical placement of reinforcement results in steel misalignment or improper location, poor concrete consolidation, or other inadequacies, complete the work using manual methods.

D. Joints. Install joints as shown on the plans. Joint sealants are not required on concrete pavement that is to be overlaid with asphaltic materials. Clean and seal joints in accordance with Item 438, “Cleaning and Sealing Joints and Cracks (Rigid Pavement and Bridge Decks).”

Repair excessive spalling of the joint saw groove using an approved method before installing the sealant. Seal all joints before opening the pavement to all traffic. When placing of concrete is stopped, install a rigid transverse bulkhead, accurately notched for the reinforcing steel and shaped accurately to the cross-section of the pavement.

1. Placing Reinforcement at Joints. Where the plans require an assembly of parts at pavement joints, complete and place the assembly at the required location and elevation with all parts rigidly secured in the required position. Accurately notch joint materials for the reinforcing steel.

2. Transverse Construction Joints.

a. Continuously Reinforced Concrete Pavement (CRCP).

Install additional longitudinal reinforcement through the bulkhead when shown on the plans. Protect the reinforcing steel immediately beyond the construction joint from damage, vibration, and impact.

b. Concrete Pavement Contraction Design (CPCD). When the placing of concrete is intentionally stopped, install and rigidly secure a complete joint assembly and bulkhead in the planned transverse contraction joint location. When the placing of concrete is unintentionally stopped, install a transverse construction joint either at a planned transverse contraction joint location or mid-slab between planned transverse contraction joints. For mid-slab construction joints, install tie bars of the size and spacing used in the longitudinal joints.

c. Curb Joints. Provide joints in the curb of the same type and location as the adjacent pavement. Use expansion joint material of the same thickness, type, and quality required for the pavement and of the section shown for the curb. Extend expansion joints through the curb. Construct curb joints at all transverse pavement joints. For non-monolithic curbs, place reinforcing steel into the plastic concrete pavement as shown on the plans unless otherwise approved. Form or saw the weakened plane joint across the full width of concrete pavement and through the monolithic curbs. Construct curb joints in accordance with Item 529, “Concrete Curb, Gutter, and Combined Curb and Gutter.”

E. Placing and Removing Forms. Use clean and oiled forms. Secure forms on a base or firm subgrade that is accurately graded and that provides stable support without deflection and movement by form riding equipment. Pin every form at least at the middle and near each end. Tightly join and key form sections together to prevent relative displacement.

Set side forms far enough in advance of concrete placement to permit inspection. Check conformity of the grade, alignment, and stability of forms immediately before placing concrete, and make all necessary corrections. Use a straightedge or other approved method to test the top of forms to ensure that the ride quality requirements for the completed pavement will be met. Stop paving operations if forms settle or deflect more than 1/8 in. under finishing operations. Reset forms to line and grade, and refinish the concrete surface to correct grade.

Avoid damage to the edge of the pavement when removing forms.

Repair damage resulting from form removal and honeycombed areas with a mortar mix within 24 hr. after form removal unless otherwise approved. Clean joint face and repair honeycombed or damaged areas within 24 hr. after a bulkhead for a transverse construction joint has been removed unless otherwise approved. When forms are removed before 72 hr. after concrete placement, promptly apply membrane curing compound to the edge of the concrete pavement.

Forms that are not the same depth as the pavement but are within 2 in. of that depth are permitted if the subbase is trenched or the full width and length of the form base is supported with a firm material to produce the required pavement thickness. Promptly repair the form trench after use. Use flexible or curved wood or metal forms for curves of 100-ft. radius or less.

F. Concrete Delivery. Clean delivery equipment as necessary to prevent accumulation of old concrete before loading fresh concrete. Use agitated delivery equipment for concrete designed to have a slump of more than 5 in. Segregated concrete is subject to rejection. Place agitated concrete within 60 min. after batching. Place non-agitated concrete within 45 min. after batching. In hot weather or under conditions causing quick setting of the concrete, times may be reduced by the Engineer. Time limitations may be extended if the Contractor can demonstrate that the concrete can be properly placed, consolidated, and finished without the use of additional water.

G. Concrete Placement. Do not allow the pavement edge to deviate from the established paving line by more than 1/2 in. at any point. Place the concrete as near as possible to its final location, and minimize segregation and rehandling. Where hand spreading is necessary, distribute concrete using shovels. Do not use rakes or vibrators to distribute concrete.

1. Pavement. Consolidate all concrete by approved mechanical vibrators operated on the front of the paving equipment. Use immersion-type vibrators that simultaneously consolidate the full width of the placement when machine finishing. Keep vibrators from dislodging reinforcement. Use hand-operated vibrators to consolidate concrete in areas not accessible to the machinemounted vibrators. Do not operate machine-mounted vibrators while the paving equipment is stationary. Vibrator operations are subject to review.

2. Date Imprinting. Imprint dates in the fresh concrete indicating the date of the concrete placement. Make impressions approximately 1 ft. from the outside longitudinal construction joint or edge of pavement and approximately 1 ft. from the transverse construction joint at the beginning of the placement day. Orient the impressions to be read from the outside shoulder in the direction of final traffic.

Impress date in DD-MM-YY format. Imprinting of the Contractor name or logo in similar size characters to the date is allowed.

3. Curbs. Where curbs are placed separately, conform to the requirements of Item 529, “Concrete Curb, Gutter, and Combined Curb and Gutter.”

4. Temperature Restrictions. Place concrete that is between 40°F and 95°F when measured in accordance with Tex-422-A at the time of discharge, except that concrete may be used if it was already in transit when the temperature was found to exceed the allowable maximum. Take immediate corrective action or cease concrete production when the concrete temperature exceeds 95°F.

Do not place concrete when the ambient temperature in the shade is below 40°F and falling unless approved. Concrete may be placed when the ambient temperature in the shade is above 35°F and rising or above 40°F. When temperatures warrant protection against freezing, protect the pavement with an approved insulating material capable of protecting the concrete for the specified curing period. Submit for approval proposed measures to protect the concrete from anticipated freezing weather for the first 72 hr. after placement. Repair or replace all concrete damaged by freezing.

H. Spreading and Finishing. Finish all concrete pavement with approved self-propelled equipment. Use power-driven spreaders, power-driven vibrators, power-driven strike-off, and screed, or approved alternate equipment. Use the transverse finishing equipment to compact and strike off the concrete to the required section and grade without surface voids. Use float equipment for final finishing. Use concrete with a consistency that allows completion of all finishing operations without addition of water to the surface. Use the minimal amount of water fog mist necessary to maintain a moist surface. Reduce fogging if float or straightedge operations result in excess slurry.

1. Finished Surface. Perform sufficient checks with long-handled 10-ft. and 15-ft. straightedges on the plastic concrete to ensure that the final surface is within the tolerances specified in Surface Test

A in Item 585, “Ride Quality for Pavement Surfaces.” Check with the straightedge parallel to the center-line.

2. Maintenance of Surface Moisture. Prevent surface drying of the pavement before application of the curing system. Accomplish this by fog applications of evaporation retardant on the pavement surface. Apply evaporation retardant at the rate recommended by the manufacturer. Reapply the evaporation retardant as needed to maintain the concrete surface in a moist condition until curing system is applied. Do not use evaporation retardant as a finishing aid. Failure to take acceptable precautions to prevent surface drying of the pavement will be cause for shut down of pavement operations.

3. Surface Texturing. Perform surface texturing using a combination of a carpet drag and metal tining. Complete final texturing before the concrete has attained its initial set. Draw the carpet drag longitudinally along the pavement surface with the carpet contact surface area adjusted to provide a satisfactory coarsely textured surface.

A metal-tine texture finish is required unless otherwise shown on the plans. Provide the metal-tine finish immediately after the concrete surface has set enough for consistent tining. Operate the metal-tine device to obtain grooves spaced at 1 in., approximately 3/16 in. deep, with a minimum depth of 1/8 in., and approximately 1/12 in. wide. Do not overlap a previously tined area. Use manual methods for achieving similar results on ramps and other irregular sections of pavements. Repair damage to the edge of the slab and joints immediately after texturing. Do not tine pavement that will be overlaid.

4. Small or Irregular Placements. Where machine placements and finishing of concrete pavement are not practical, use hand equipment and procedures that produce a consolidated and finished pavement section to the line and grade.

5. Emergency Procedures. Use hand-operated equipment for applying texture, evaporation retardant, and cure in the event of equipment breakdown.

I. Curing. Keep the concrete pavement surface from drying by water fogging until the curing material has been applied. Maintain and promptly repair damage to curing materials on exposed surfaces of concrete pavement continuously for at least 3 curing days. A curing day is defined as a 24-hr. period when either the temperature taken in the shade away from artificial heat is above 50°F for at least 19 hr. or when the surface temperature of the concrete is maintained above 40°F for 24 hr. Curing begins when the concrete curing system has been applied.

Stop concrete paving if curing compound is not being applied promptly and maintained adequately. Other methods of curing in accordance with Item 420, “Concrete Structures,” may be used when specified or approved.

1. Membrane Curing. After texturing and immediately after the free surface moisture has disappeared, spray the concrete surface uniformly with 2 coats of membrane curing compound at an individual application rate of not more than 180 sq. ft. per gallon.

Apply the first coat within 10 min. after completing texturing operations. Apply the second coat within 30 min. after completing texturing operations.

Before and during application, maintain curing compounds in a uniformly agitated condition, free of settlement. Do not thin or dilute the curing compound.

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Where the coating shows discontinuities or other defects or if rain falls on the newly coated surface before the film has dried enough to resist damage, apply additional compound at the same rate of coverage to correct the damage. Ensure that the curing compound coats the sides of the tining grooves.

2. Asphalt Curing. When an asphaltic concrete overlay is required, apply a uniform coating of asphalt curing at a rate of 90 to 180 sq. ft. per gallon as required. Apply curing immediately after texturing and just after the free moisture (sheen) has disappeared. Obtain approval to add water to the emulsion to improve spray distribution. Maintain the asphalt application rate when using diluted emulsions. Maintain the emulsion in a mixed condition during application.

3. Curing Class HES Concrete. For all Class HES concrete pavement, provide membrane curing in accordance with Section 360.4.I.1, “Membrane Curing,” followed promptly by water curing until opening strength is achieved but not less than 24 hr.

J. Sawing Joints. Saw joints to the depth shown on the plans as soon as sawing can be accomplished without damage to the pavement regardless of time of day or weather conditions. Some minor raveling of the saw cut is acceptable. Use a chalk line, string line, sawing template, or other approved method to provide a true joint alignment.

Provide enough saws to match the paving production rate to ensure sawing completion at the earliest possible time to avoid uncontrolled cracking. Reduce paving production if necessary to ensure timely sawing of joints. Promptly restore membrane cure damaged within the first 72 hr. of curing.

K. Protection of Pavement and Opening to Traffic. Testing for early opening is the responsibility of the Contractor regardless of job-control testing responsibilities unless otherwise shown in the plans or directed.

Testing result interpretation for opening to traffic is subject to the approval of the Engineer.

1. Protection of Pavement. Erect and maintain barricades and other standard and approved devices that will exclude all vehicles and equipment from the newly placed pavement for the periods specified. Before opening to traffic, protect the pavement from damage due to crossings using approved methods. Where a detour is not readily available or economically feasible, an occasional crossing of the roadway with overweight equipment may be permitted for relocating equipment only but not for hauling material. When an occasional crossing of overweight equipment is permitted, temporary matting or other approved methods may be required.

Maintain an adequate supply of sheeting or other material to cover and protect fresh concrete surface from weather damage. Apply as needed to protect the pavement surface from weather.

2. Opening Pavement to All Traffic. Pavement that is 7 days old may be opened to all traffic. Before opening to traffic, clean pavement, place stable material against the pavement edges, seal joints, and perform all other traffic safety related work.

3. Opening Pavement to Construction Equipment. Unless otherwise shown on the plans, concrete pavement may be opened early to concrete paving equipment and related delivery equipment after the concrete is at least 48 hr. old and opening strength has been demonstrated in accordance with Section 360.4.K.4, “Early Opening to All Traffic,” before curing is complete. Keep delivery equipment at least 2 ft. from the edge of the concrete pavement.

Keep tracks of the paving equipment at least 1 ft. from the pavement edge. Protect textured surfaces from the paving equipment. Restore damaged membrane curing as soon as possible.

Repair pavement damaged by paving or delivery equipment before opening to all traffic.

4. Early Opening to All Traffic. Concrete pavement may be opened after curing is complete and the concrete has attained a flexural strength of 450 psi or a compressive strength of 2,800 psi, except that pavement using Class HES concrete may be opened after 24 hr. if the specified strength is achieved.

a. Strength Testing. Test concrete specimens cured under the same conditions as the portion of the pavement involved.

b. Maturity Method. Unless otherwise shown on the plans, the maturity method, Tex-426-A, may be used to estimate concrete strength for early opening pavement to traffic. Install at least 2 maturity thermocouples for each day's placement in areas where the maturity method will be used for early opening. Thermocouples, when used, will be installed near the days final placement for areas being evaluated for early opening. Use test specimens to verify the strength–maturity relationship in accordance with Tex-426-A, starting with the first day's placement corresponding to the early opening pavement section.

After the first day, verify the strength–maturity relationship at least every 10 days of production. Establish a new strength–maturity relationship when the strength specimens deviate more than 10% from the maturity-estimated strengths.

Suspend use of the maturity method for opening pavements to traffic when the strength–maturity relationship deviates by more than 10% until a new strength–maturity relationship is established.

When the maturity method is used intermittently or for only specific areas, the frequency of verification will be as determined by the Engineer.

5. Emergency Opening to Traffic. Under emergency conditions, when the pavement is at least 72 hr. old, open the pavement to traffic when directed in writing. Remove all obstructing materials, place stable material against the pavement edges, and perform other work involved in providing for the safety of traffic as required for emergency opening.

L. Pavement Thickness. The Engineer will check the thickness in accordance with Tex-423-A unless other methods are shown on the plans. The Engineer will perform 1 thickness test consisting of 1 reading at approximately the center of each lane every 500 ft. or fraction thereof. Core where directed in accordance with Tex-424-A to verify deficiencies of more than 0.2 in. from plan thickness and to determine the limits of deficiencies of more than 0.75 in. from plan thickness. Fill core holes using a concrete mixture and method approved by the Engineer.

1. Thickness Deficiencies Greater than 0.2 in. When any depth test measured in accordance with Tex-423-A is deficient by more than 0.2 in. from the plan thickness, take one 4-in. diameter core at that location to verify the measurement.

If the core is deficient by more than 0.2 in. but not by more than 0.75 in. from the plan thickness, take 2 additional cores from the unit (as defined in Section 360.4.L.3, "Pavement Units for Payment Adjustment") at intervals of at least 150 ft. and at locations selected by the Engineer, and determine the thickness of the unit for payment purposes by averaging the length of the 3 cores. In calculations of the average thickness of this unit of pavement, measurements in excess of the specified thickness by more than 0.2 in. will be considered as the specified thickness plus 0.2 in.

2. Thickness Deficiencies Greater than 0.75 in. If a core is deficient by more than 0.75 in., take additional cores at 10 ft. intervals in each direction parallel to the centerline to determine the boundary of the deficient area. The Engineer will evaluate any area of pavement found deficient in thickness by more than 0.75 in. but not more than 1 in. As directed, remove and replace the deficient areas without additional compensation or retain deficient areas without compensation. Remove and replace any area of pavement found deficient in thickness by more than 1 in. without additional compensation.

3. Pavement Units for Payment Adjustment. Limits for applying a payment adjustment for deficient pavement thickness from 0.20 in. to not more than 0.75 in. are 500 ft. of pavement in each lane. Lane width will be as shown on typical sections and pavement design standards.

For greater than 0.75 in. deficient thickness, the limits for applying zero payment or requiring removal will be defined by coring or equivalent nondestructive means as determined by the Engineer.

The remaining portion of the unit determined to be less than 0.75 in. deficient will be subject to the payment adjustment based on the average core thickness at each end of the 10 ft. interval investigation as determined by the Engineer.

Shoulders will be measured for thickness unless otherwise shown on the plans. Shoulders 6 ft. wide or wider will be considered as lanes. Shoulders less than 6 ft. wide will be considered part of the adjacent lane.

Limits for applying payment adjustment for deficient pavement thickness for ramps, widenings, acceleration and deceleration lanes, and other miscellaneous areas are 500 ft. in length. Areas less than 500 ft. in length will be individually evaluated for payment adjustment based on the plan area.

M. Ride Quality. Unless otherwise shown on the plans, measure ride quality in accordance with Item 585, “Ride Quality for Pavement Surfaces.”

360.5. Measurement. This Item will be measured as follows:

A. Concrete Pavement. Concrete pavement will be measured by the square yard of surface area in place. The surface area includes the portion of the pavement slab extending beneath the curb.

B. Curb. Curb on concrete pavement will be measured by the foot in place.

360.6. Payment. These prices are full compensation for materials, equipment, labor, tools, and incidentals.

A. Concrete Pavement. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the adjusted unit price bid for “Concrete Pavement” of the type and depth specified as adjusted in accordance with Section 360.6.B, “Deficient Thickness Adjustment.”

B. Deficient Thickness Adjustment. Where the average thickness of pavement is deficient in thickness by more than 0.2 in. but not more than 0.75 in., payment will be made using the adjustment factor as specified in Table 2 applied to the bid price for the deficient area for each unit as defined under Section 360.4.L.3, “Pavement Units for Payment Adjustment.”

Table 2
Deficient Thickness Price Adjustment Factor

Deficiency in Thickness Determined by Cores (in.)	Proportional Part of Contract Price Allowed (adjustment factor)
Not deficient	1.00
Over 0.00 through 0.20	1.00
Over 0.20 through 0.30	0.80
Over 0.30 through 0.40	0.72
Over 0.40 through 0.50	0.68
Over 0.50 through 0.75	0.57

C. Curb. Work performed and furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Curb" of the type specified.

400 ITEMS — STRUCTURES

ITEM 400 - EXCAVATION AND BACKFILL FOR STRUCTURES

400.1. Description. Excavate for placement and construction of structures and backfill structures. Cut and restore pavement.

400.2. Materials. Use materials that meet the requirements of the following

Items:

• Item 401, "Flowable Backfill"

• Item 421, "Hydraulic Cement Concrete"

• DMS-4600, "Hydraulic Cement."

400.3. Construction.

A. Excavation.

1. General. Excavate to the lines and grades shown on the plans or as directed. Provide slopes, benching, sheeting, bracing, pumping, and bailing as necessary to maintain the stability and safety of excavations up to 5 ft. deep. Excavation protection for excavations deeper than 5 ft. are governed by Item 402, "Trench Excavation

Protection," and Item 403, "Temporary Special Shoring." Use satisfactory excavated material as backfill or as embankment fill in accordance with Item 132, "Embankment." Dispose of material not incorporated into the final project off the right of way in accordance with federal, state, and local regulations.

When excavating for installation of structures across private property or beyond the limits of the embankment, keep any topsoil removed separate, and replace it, as nearly as feasible, in its original position. Restore the area to an acceptable condition.

Excavate drilled shafts in accordance with Item 416, "Drilled Shaft Foundations."

a. Obstructions. Remove obstructions to the proposed construction, including trees and other vegetation, debris, and structures, over the width of the excavation to a depth of 1 ft. below the bottom of excavation. If abandoned storm drains, sewers, or other drainage systems are encountered, remove as required to clear the new structure, and plug in an approved manner. After removing obstructions, restore the bottom of the excavation to grade by backfilling in accordance with this Item. Dispose of surplus materials in accordance with federal, state, and local regulations.

b. Excavation in Streets. When structures are installed in streets, highways, or other paved areas, cut pavement and base to neat lines. Restore pavement structure after completion of excavation and backfilling.

Maintain and control traffic in accordance with the approved traffic control plan and the TMUTCD.

c. Utilities. Comply with the requirements of Article 7.12, "Responsibility for Damage Claims." Conduct work with minimum disturbance of existing utilities, and coordinate work in or near utilities with the utility

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owners. Inform utility owners sufficiently before work begins to allow them time to identify, locate, reroute, or make other adjustments to utility lines.

Avoid cutting or damaging underground utility lines that are to remain in place. If damage occurs, promptly notify the utility company. If an active sanitary sewer line is damaged during excavation, provide temporary flumes across the excavation while open, and restore the lines when backfilling has progressed to the original bedding lines of the cut sewer.

d. De-Watering. Do not construct or place structures in the presence of water unless approved. Place precast members, pipe, and concrete only on a dry, firm surface. Remove water by bailing, pumping, well-point installation, deep wells, underdrains, or other approved method.

If structures are approved for placement in the presence of water, remove standing water in a manner that does not allow water movement through or alongside concrete being placed.

Do not pump or bail while placing structural concrete or for a period of at least 36 hr. thereafter unless from a suitable sump separated from the concrete work. Pump or bail during placement of seal concrete only to the extent necessary to maintain a static head of water within the cofferdam. Do not pump or bail to de-water inside a sealed cofferdam until the seal has aged at least 36 hr.

If the bottom of an excavation cannot be de-watered to the point that the subgrade is free of mud or it is difficult to keep reinforcing steel clean, place a stabilizing material in the bottom of the excavation. Stabilizing material may be flexible base, cement-stabilized base or backfill, lean concrete, or other approved material. If lean concrete is used, provide concrete with at least 275 lb. of cement per cubic yard, and place to a minimum depth of 3 in. Stabilizing material placed for the convenience of the Contractor will be at the Contractor's expense.

2. Bridge Foundations and Retaining Walls. Do not disturb material below the bottom of footing grade. Do not backfill to compensate for excavation that has extended below grade. If excavation occurs below the proposed footing grade, fill the area with concrete at the time the footing is placed. The additional concrete placed will be at the Contractor's expense.

If requested, take cores to determine the character of the supporting materials. Provide an intact sample adequate to judge the character of the founding material. Take these cores when the excavation is close to completion. Cores should be approximately 5 ft. deeper than the proposed founding grade.

If the founding stratum is rock or other hard material, remove loose material, clean, and cut to a firm surface that is level, stepped, or serrated, as directed. Clean out soft seams, and fill with concrete at the time the footing is placed.

If the material at the footing grade of a retaining wall, bridge bent, or pier is a mixture of compressible and incompressible material, do not place the foundation until the Engineer has inspected the excavation and authorized changes have been made to provide a uniform bearing condition.

3. Cofferdams. The term "cofferdam" designates any temporary or removable structure constructed to hold surrounding earth, water, or both out of the excavation whether the structure is formed of soil, timber, steel, concrete, or a combination of these. Cofferdams may require the use of pumping wells or well points for dewatering.

For sheet-pile or other types of cofferdams requiring structural members, submit details and design calculations bearing the seal of a licensed professional engineer for review before constructing the cofferdam. The Department reserves the right to reject designs.

Design structural systems to comply with the AASHTO *Standard Specifications for Highway Bridges* or AASHTO *LRFD Bridge*

Design Specifications. Interior dimensions of cofferdams must provide sufficient clearance for the construction, inspection, and removal of required forms and, if necessary, sufficient room to allow pumping outside the forms. In general, extend sheet-pile cofferdams well below the bottom of the footings, and make concrete seals as well braced and watertight as practicable.

For foundation seals, use Class E concrete unless otherwise specified. Place concrete foundation seals in accordance with Item 420, “Concrete Structures.” Seals placed for the convenience of the Contractor will be at the Contractor’s expense.

When the Engineer judges it to be impractical to de-water inside a cofferdam and a concrete seal is to be placed around piling driven within the cofferdam, make the excavation deep enough to allow for swelling of the material at the base of the excavation during pile-driving operations. After driving the piling, remove swelling material to the bottom of the seal grade. Where it is possible to dewater inside the cofferdam without placing a seal, remove the foundation material to exact footing grades after driving piling. Do not backfill a foundation to compensate for excavation that has been extended below grade; fill such areas below grade with concrete at the time the seals or footings are placed.

Unless otherwise provided, remove cofferdams after completing the substructure without disturbing or damaging the structure.

4. Culverts and Storm Drains. When the design requires special bedding conditions for culverts or storm drains, an excavation diagram will be shown on the plans. Do not exceed these limits of excavation.

Unless otherwise shown on the plans, construct pipe structures in an open cut with vertical sides extending to a point 1 ft. above the pipe. When site conditions or the plans do not prohibit sloping the cut, the excavation may be stepped or laid back to a stable slope beginning 1 ft. above the pipe. Maintain the stability of the excavation throughout the construction period.

For pipe to be installed in fill above natural ground, construct the embankment to an elevation at least 1 ft. above the top of the pipe, and then excavate for the pipe.

a. Unstable Material. When unstable soil is encountered at established footing grade, remove the material to a depth of no more than 2 ft. below the grade of the structure unless the

Engineer authorizes additional depth. Replace soil removed with stable material in uniform layers at most 8 in. deep (loose measurement). Each layer must have enough moisture to be compacted by rolling or tamping as required to provide a stable foundation for the structure.

When it is not feasible to construct a stable foundation as outlined above, use special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other approved material.

b. Incompressible Material. If rock, part rock, or other incompressible material is encountered at established footing grade while placing prefabricated elements, remove the incompressible material to 6 in. below the footing grade, backfill with an approved compressible material, and compact in accordance with Section 400.3.C, “Backfill.”

B. Shaping and Bedding. For precast box sections, place at least 2 in. of fine granular material on the base of the excavation before placing the box sections. For pipe installations, use bedding as shown in Figure 1.

Use Class C bedding unless otherwise shown on the plans. The Engineer may require the use of a template to secure reasonably accurate shaping of the foundation material. Where cement-stabilized backfill is indicated on the plans, undercut the excavation at least 4 in. and backfill with stabilized material to support the pipe or box at the required grade.

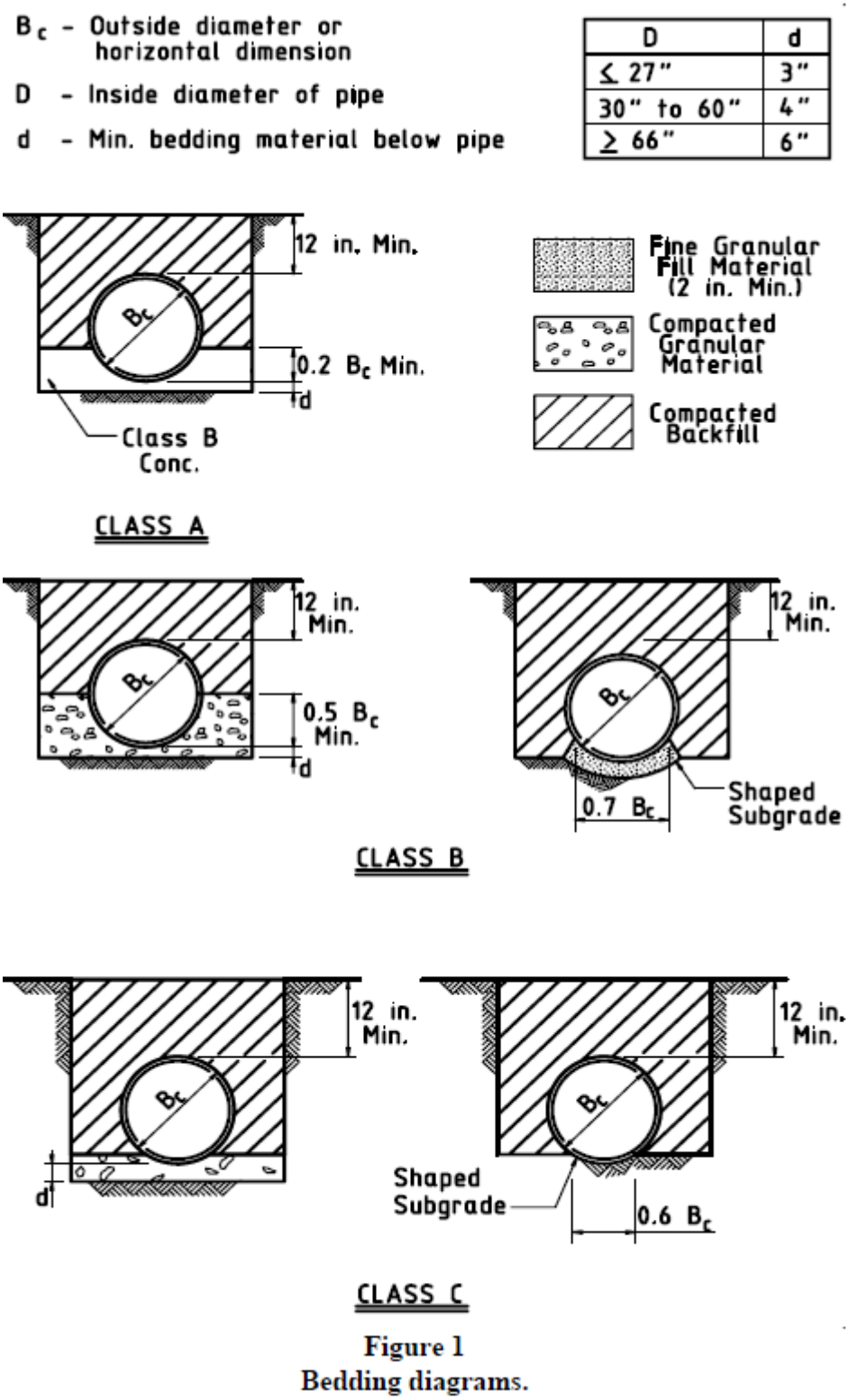

Figure 1
Bedding diagrams.

C. Backfill.

1. General. As soon as practical, backfill the excavation after placement of the permanent structure. Use backfill free from stones large enough to interfere with compaction; large or frozen lumps that will not

break down readily under compaction; and wood or other extraneous material. Obtain backfill material from excavation or from other sources.

In areas not supporting a completed roadbed, retaining wall, or embankment, place backfill in layers at most 10 in. deep (loose measurement). In areas supporting a portion of a roadbed, retaining wall, or embankment, place backfill in uniform layers at most 8 in. deep (loose measurement). Compact each layer to meet the density requirements of the roadbed, retaining wall, embankment material, or as shown on the plans.

Bring each layer of backfill material to the moisture content needed to obtain the required density. Use mechanical tamps or rammers to compact the backfill. Rollers may be used to compact backfill if feasible.

Cohesionless materials such as sand may be used for backfilling. Compact cohesionless materials using vibratory equipment, waterponding, or a combination of both.

2. Bridge Foundations, Retaining Walls, and Box Culverts. Do not place backfill against the structure until the concrete has reached the design strength required in Item 421, “Hydraulic Cement Concrete.”

Backfill retaining walls with material meeting the requirements of Item 423, “Retaining Walls.” Backfill around bridge foundations and culverts using material with no particles more than 4 in. in greatest dimension and with a gradation that permits thorough compaction. Rock or gravel mixed with soil may be used if the percentage of fines is sufficient to fill all voids and ensure a uniform and thoroughly compacted mass of proper density.

Where backfill material is being placed too close to the structure to permit compaction with blading and rolling equipment, use mechanical tamps and rammers to avoid damage to the structure.

Avoid wedging action of backfill against structures. To prevent such action, step or serrate slopes bounding the excavation. Place backfill uniformly around bridge foundations. Place backfill along both sides of culverts equally and in uniform layers.

The Engineer may require backfilling of structures excavated into hard, erosion-resistant material, and subject to erosive forces, with stone or lean concrete.

Box culverts may be opened to traffic as soon as sufficient backfill and embankment has been placed over the top to protect culverts against damage from heavy construction equipment. Repair damage to culvert caused by construction traffic at no additional expense to the Department.

3. Pipe. After installing bedding and pipe as required, bring backfill material to the proper moisture condition and place it equally along both sides of the pipe in uniform layers at most 8 in. deep (loose measurement). Compact each lift mechanically. Thoroughly compact materials placed under the haunches of the pipe to prevent damage or displacement of the pipe. Continue to place backfill in this manner to the top-of-pipe elevation. Place and compact backfill above the top of the pipe in accordance with Section 400.3.C.1, “General.”

The Engineer may reject backfill material containing more than 20% by weight of material retained on a 3-in. sieve; with large lumps not easily broken down; or that cannot be spread in loose layers. Material excavated by a trenching machine will generally meet the requirements of this Section as long as large stones are not present.

Where pipe extends beyond the toe of slope of the embankment and the depth of cover provided by backfill to the original ground level is less than the minimum required by the specifications for the type of pipe involved, place and compact additional material until the minimum cover has been provided.

4. Cement-Stabilized Backfill. When shown on the plans, backfill the excavation to the elevations shown with cement-stabilized backfill. Use cement-stabilized backfill that contains aggregate, water, and a minimum of 7% hydraulic cement based on the dry weight of the aggregate, in accordance with Tex-120-E. Use clean sand as aggregate for cement-stabilized backfill unless otherwise shown on the plans. Use only approved aggregate.

Place cement-stabilized backfill equally along the sides of structures to prevent strain on or displacement of the structure. Fill voids when placing cement-stabilized backfill. Use hand operated tampers if necessary to fill voids.

5. Flowable Backfill. When shown on the plans, backfill the excavation with flowable backfill to the elevations shown. Prevent the structure from being displaced during the placement of the flowable fill, and prevent flowable fill from entering culverts and drainage structures.

400.4. Measurement. This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2, “Plans Quantity Measurement.” Additional measurements or calculations will be made if adjustments of quantities are required.

A. Structural Excavation. Unless shown on the plans as a pay item, structural excavation quantities shown are for information purposes only.

When structural excavation is specified as a pay item, structural excavation for pipe headwalls, inlets, manholes, culvert or storm drain extensions less than 15 ft. long, bridge abutments, retaining walls, and side road and private entrance pipe culverts will not be measured. No allowance will be made for variance from plans quantity incurred by an alternate bid.

When specified as a pay item, structural excavation will be measured by the cubic yard as computed by the average end areas method.

Excavation diagrams on the plans take precedence over the provisions of this Article.

1. Boundaries of Measurement.

a. Pipe.

(1) Pipe up to 42 Inches. For pipe 42 in. or less in nominal or equivalent diameter, no material outside of vertical planes 1 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.

(2) Pipe Larger than 42 Inches. For pipes larger than 42-in. nominal or equivalent diameter, no material outside of vertical planes located 2 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.

Quantities for excavation in fill above natural ground include 1 ft. above the top of the pipe regardless of the height of completed fill. Excavation for pipe will be measured between the extreme ends of the completed structure including end appurtenances as shown on the plans and from centerline to centerline of inlets, manholes, etc.

b. Structural Plate Structures. No material outside of vertical planes 3 ft. beyond and parallel to the horizontal projection of the outside surfaces of the structure will be included. When the quality of the existing soil or embankment is less than that of the proposed backfill material, the limits of measurement will be extended to vertical planes located 1/2 of the span beyond the horizontal projection of the outside surfaces of the structure.

c. Footings, Walls, Boxes, and Other Excavation. No material outside of vertical planes 1 ft. beyond and parallel to the edges of the footings or outside walls will be included whether or not a cofferdam or shoring is used. When plans provide the option of cast-in-place or precast boxes, measurement will be based on the cast-in-place option.

Where excavation in addition to that allowed for the footings is required for other portions of the structure, measurement for the additional excavation will be limited laterally by vertical planes 1 ft. beyond the face of the member and parallel to it, and vertically to a depth of 1 ft. below the bottom of the member.

d. Excavation near Roadways and Channels. At structure sites other than culverts and pipe excavations, the measurement of structural excavation will include only material below or outside the limits of the completed road or channel excavation.

Roadway and channel excavation will be paid under Item 110, “Excavation.” For culverts except side road and private entrance culverts, excavation within the limits of the structure and below or outside the limits of the completed roadway excavation will be measured as structural excavation.

2. Falsework. No measurement will be made for excavation necessary for placing forms or falsework that exceeds the limits given in Section 400.4.B.1, “Boundaries of Measurement.”

3. Swelling. Measurement will not include materials removed below footing grades to compensate for anticipated swelling due to pile driving, nor will it include material required to be removed due to swelling beyond the specified limits during pile driving operations.

4. Cave-ins. Measurement will not include additional volume caused by slips, slides, cave-ins, silting, or fill material resulting from the action of the elements or the Contractor’s operation.

5. Undercut. Where rock or other incompressible or unstable material is undercut to provide a suitable foundation for pipe or box sections, such material below grade directed to be removed will be measured for payment.

6. Grade Change. Additional measurement will be made of the volume of excavation involved in the lowering or raising of the elevation of a footing, foundation, or structure unit, when such grade change is authorized.

B. Cement-Stabilized Backfill. Cement-stabilized backfill will be measured by the cubic yard as shown on the plans.

C. Cutting and Restoring Pavement. Cutting and restoring pavement will be measured by the square yard as shown on the plans. Excavation below pavement or base will be measured as structural excavation of the pertinent type.

400.5. Payment.

A. Structural Excavation. Unless specified as a pay item, structural excavation and backfill performed and material furnished in accordance with this Item will not be paid for directly but are subsidiary to pertinent Items.

When structural excavation is specified as a pay item, the excavation and backfill work performed and materials furnished will be paid for at the unit price bid for “Structural Excavation,” “Structural Excavation (Box),” “Structural Excavation (Pipe),” and “Structural Excavation (Bridge).” This price includes concrete to compensate for excavation that has extended below grade for bridge foundations and retaining walls, and backfilling and compacting areas that were removed as part of structural excavation.

Cofferdams or other measures necessary for supporting excavations less than 5 ft. deep will not be measured or paid for directly but will be subsidiary to the Contract.

Foundation seal concrete for cofferdams, when required by the Engineer, will be paid for as provided in the pertinent Items. If no direct method of payment is provided in the Contract, the work will be measured and paid for in accordance with Article 9.4, “Payment for Extra Work.” Seal placed for the convenience of the Contractor will not be paid for.

Unless otherwise provided, stone or lean concrete backfill around structures as provided for in Section 400.3.C.2, “Bridge Foundations, Retaining Walls, and Culverts,” will be measured and paid for as extra work in accordance with Article 9.4.

When structural excavation is specified as a pay item, a partial payment of 50% of the bid price will be made for structural excavation completed to the satisfaction of the Engineer but not backfilled. The remaining amount will be paid upon completion of backfilling. When the Contractor elects to excavate beyond plan requirements, no measurement will be made of the additional volume.

B. Removal and Replacement of Unsuitable or Incompressible

Material. Removal and replacement of material will be paid for if directed. Removal and replacement of material or placement of special material made necessary by the softening of founding material due to the Contractor’s sequence of work or operation, will be at the Contractor’s expense. Special material used or additional excavation made for the Contractor’s convenience will not be paid for.

1. Structural Excavation as a Pay Item. Where special materials are not required or specified, payment for the removal and replacement of unstable or incompressible material will be made at a price equal to 200% of the unit price bid per cubic yard for Structural Excavation. When the Contractor elects to remove and replace material deeper than directed, no measurement will be made on that portion below the directed elevation. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When the plans specify or when the Engineer directs the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, payment for excavation below footing grades will be made at the unit price bid for Structural Excavation. Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these items in the Contract, or, if the required material is not a bid item, in accordance with Article 9.4, “Payment for Extra Work.”

2. Structural Excavation Not a Pay Item. Where special materials for backfill are not required or specified, payment for the authorized removal and replacement of unstable or incompressible material will be measured and paid for at $15 per cubic yard of material removed. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When the plans specify or when the Engineer directs the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, excavation below the footing grades will be paid for at $10 per cubic yard.

Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these

Items, or, if the required material is not a bid Item, in accordance with Article 9.4, “Payment for Extra Work.”

C. Lowering of a Structure Foundation. If the Engineer requires a structure foundation to be lowered to an elevation below the grade shown on the plans, over excavation will be paid in accordance with

Table 1.

Table 1
Payment for Required Overexcavation

Variance of revised footing grade from plan grade	Payment terms	Variance of revised footing grade from plan grade
	"Structural Excavation" is a bid item	"Structural Excavation" is not a bid item
Up to and including 5 ft.	Unit price equal to 115% of unit price bid for "Structural Excavation"	$10 per cubic yard
Over 5 ft. up to 10 ft.	Unit price equal to 125% of unit price bid for "Structural Excavation"	$12 per cubic yard
Over 10 ft.	In accordance with Article 9.4, "Payment for Extra Work"	

D. Cement-Stabilized Backfill. Cement-stabilized backfill will be paid for at the unit price bid for "Cement Stabilized Backfill."

E. Cutting and Restoring Pavement. Cutting and restoring pavement will be paid for at the unit price bid for "Cutting and Restoring Pavement." Work done to repair damage to base or pavement incurred outside the limits shown on the plans, or the limits authorized by the Engineer, will not be measured for payment.

The unit prices bid are full compensation for excavation including removing obstructions and plugging drainage systems; bedding and backfilling including placing, sprinkling and compaction of material; soundings; cleaning and filling seams; constructing and removing cofferdams; de-watering, sheeting, or bracing excavations up to and including 5 ft. deep; pumps; drills; explosives; disposition of surplus material; cutting pavement and base to neat lines; and materials, hauling, equipment, labor, tools, and incidentals.

Flowable backfill will be paid for as provided in Item 401, "Flowable Backfill." Protection methods for open excavations deeper than 5 ft. will be measured and paid for as required under Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring."

ITEM 440 - REINFORCING STEEL

440.1. Description. Furnish and place reinforcing steel of the sizes and details shown on the plans.

440.2. Materials.

A. Approved Mills. Before furnishing steel, producing mills of reinforcing steel for the Department must be pre-approved in accordance with DMS-7320, "Qualification Procedure for Reinforcing Steel Mills," by

the Construction Division, which maintains a list of approved producing mills. Reinforcing steel obtained from unapproved sources will not be accepted.

B. Deformed Bar and Wire Reinforcement. Unless otherwise shown on the plans, reinforcing steel must be Grade 60, and bar reinforcement must be deformed. Reinforcing steel must conform to one of the following:

• ASTM A 615, Grades 40 or 60;

• ASTM A 996, Type A, Grades 40 or 60;

• ASTM A 996, Type R, Grade 60, permitted in concrete pavement only (Furnish ASTM A 996, Type R bars as straight bars only and do not bend them. Bend tests are not required.); or

• ASTM A 706.

The provisions of this Item take precedence over ASTM provisions.

The nominal size, area, and weight of reinforcing steel bars covered by this Item are shown in Table 1. Designate smooth bars up to No. 4 by size number and above No. 4 by diameter in inches.

Table 1
Size, Area, and Weight of Reinforcing Steel Bars

Bar Size Number (in.)	Bar Size Number (mm)	Diameter (in.)	Area (Sq. in.)	Weight per Ft.
3	10	0.375	0.11	0.376
4	13	0.500	0.20	0.668
5	16	0.625	0.31	1.043
6	19	0.750	0.44	1.502
7	22	0.875	0.60	2.044
8	25	1.000	0.79	2.670
9	29	1.128	1.00	3.400
10	32	1.270	1.27	4.303
11	36	1.410	1.56	5.313
14	43	1.693	2.25	7.650
18	57	2.257	4.00	13.60

Note: Bar size numbers (in.) are based on the number of eighths of an inch included in the nominal diameter of the bar. Bar size numbers (mm) approximate the number of millimeters included in the nominal diameter of the bar.

C. Smooth Bar and Spiral Reinforcement. Smooth bars and dowels for concrete pavement must have a minimum yield strength of 60 ksi and meet ASTM A 615. For smooth bars that are larger than No. 3, provide steel conforming to ASTM A 615 or meet the physical requirements of ASTM A 36.

Spiral reinforcement may be smooth or deformed bars or wire of the minimum size or gauge shown on the plans. Bars for spiral reinforcement must comply with ASTM A 615, Grade 40; ASTM A 996, Type A, Grade 40; or ASTM A 675, Grade 80, meeting dimensional requirements of ASTM A 615. Smooth wire must comply with ASTM A 82, and deformed wire must comply with ASTM A 496.

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D. Weldable Reinforcing Steel. Reinforcing steel to be welded must comply with ASTM A 706 or have a carbon equivalent (C.E.) of at most 0.55%. A report of chemical analysis showing the percentages of elements necessary to establish C.E. is required for reinforcing steel that does not meet ASTM A 706 to be structurally welded. These requirements do not pertain to miscellaneous welds on reinforcing steel as defined in Section 448.4.B.1.a, “Miscellaneous Welding Applications.”

Calculate C.E. using the following formula:

$$C.E. = \%C + \frac{\%Mn}{6} + \frac{\%Cu}{40} + \frac{\%Ni}{20} + \frac{\%Cr}{10} - \frac{\%Mo}{50} - \frac{\%V}{10}$$

E. Welded Wire Fabric. For fabric reinforcement, use wire that conforms to ASTM A 82 or A 496. Use wire fabric that conforms to ASTM A 185 or A 497. Observe the relations shown in Table 2 among size number, diameter in inches, and area when ordering wire by size numbers, unless otherwise specified. Precede the size number for deformed wire with “D” and for smooth wire with “W.”

Designate welded wire fabric as shown in the following example: 6 × 12 – W16 × W8 (indicating 6-in. longitudinal wire spacing and 12-in. transverse wire spacing with smooth No. 16 wire longitudinally and smooth No. 8 wire transversely).

Table 2
Wire Size Number, Diameter, and Area

Size Number (in.)	Size Number (mm)	Diameter (in.)	Area (sq. in.)
31	200	0.628	0.310
30	194	0.618	0.300
28	181	0.597	0.280
26	168	0.575	0.260
24	155	0.553	0.240
22	142	0.529	0.220
20	129	0.505	0.200
18	116	0.479	0.180
16	103	0.451	0.160
14	90	0.422	0.140
12	77	0.391	0.120
10	65	0.357	0.100
8	52	0.319	0.080
7	45	0.299	0.070
6	39	0.276	0.060
5.5	35	0.265	0.055
5	32	0.252	0.050
4.5	29	0.239	0.045
4	26	0.226	0.040
3.5	23	0.211	0.035
2.9	19	0.192	0.035
2.5	16	0.178	0.025
2	13	0.160	0.020
1.4	9	0.134	0.014
1.2	8	0.124	0.012
0.5	3	0.080	0.005

Note: Size numbers (in.) are the nominal cross-sectional area of the wire in hundredths of a square inch. Size numbers (mm) are the nominal cross-sectional area of the wire in square millimeters. Fractional sizes between the sizes listed above are also available and acceptable for use.

F. Epoxy Coating. Epoxy coating will be required as shown on the plans.

Before furnishing epoxy-coated reinforcing steel, an epoxy applicator must be pre-approved in accordance with DMS-7330, “Qualification Procedure for Reinforcing Steel Epoxy Coating Applicators.” The Construction Division maintains a list of approved applicators.

Coat reinforcing steel in accordance with Table 3.

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Table 3
Epoxy Coating Requirements for Reinforcing Steel

Material	Specification
Bar	ASTM A 775 or A 934
Wire or fabric	ASTM A 884 Class A or B
Mechanical couplers	As shown on the plans
Hardware	As shown on the plans

Use epoxy coating material and coating repair material that complies with DMS-8130, “Epoxy Powder Coating for Reinforcing Steel.” Do not patch more than 1/4 in. total length in any foot at the applicator’s plant.

Epoxy-coated reinforcement will be sampled and tested in accordance with Tex-739-I.

Maintain identification of all reinforcing throughout the coating and fabrication and until delivery to the project site.

Furnish 1 copy of a written certification that the coated reinforcing steel meets the requirements of this Item and 1 copy of the manufacturer’s control tests.

G. Mechanical Couplers. When mechanical splices in reinforcing steel bars are shown on the plans, use the following types of coupler:

• sleeve-filler,

• sleeve-threaded,

• sleeve-swaged, or

• sleeve-wedge.

Furnish only couplers that have been produced by a manufacturer that has been prequalified in accordance with DMS-4510, “Mechanical Couplers.” Sleeve-wedge type couplers will not be permitted on coated reinforcing. Couplers for use on individual projects must be sampled and tested in accordance with DMS-4510. Furnish couplers only at locations shown on the plans.

440.3. Construction.

A. Bending. Cold-bend the reinforcement accurately to the shapes and dimensions shown on the plans. Fabricate in the shop if possible. Fieldfabricate, if permitted, using a method approved by the Engineer.

Replace improperly fabricated, damaged, or broken bars at no additional expense to the Department. Repair damaged or broken bars embedded in a previous concrete placement using a method approved by the Engineer.

Unless otherwise shown on the plans, the inside diameter of bar bends, in terms of the nominal bar diameter (d), must be as shown in Table 4.

Table 4
Minimum Inside Diameter of Bar Bends

Bend	Bar Size Number (in.)	Bar Size Number (mm)	Diameter
Bends of 90° and greater in stirrups, ties, and other secondary bars that enclose another bar in the bend	3, 4, 5	10, 13, 16	4d
	6, 7, 8	19, 22, 25	6d
Bends in main bars and in secondary bars not covered above	3 through 8	10 through 25	6d
	9, 10, 11	29, 32, 36	8d
	14, 18	43, 57	10d

Note: Bar size numbers (in.) are based on the number of eighths of an inch included in the nominal diameter of the bar. Bar size numbers (mm) approximate the number of millimeters included in the nominal diameter of the bar.

Where bending No. 14 or No. 18 Grade 60 bars is required, bend-test representative specimens as described for smaller bars in the applicable ASTM specification. Make the required 90° bend around a pin with a diameter of 10 times the nominal diameter of the bar.

B. Tolerances. Fabrication tolerances for bars are shown in Figure 1.

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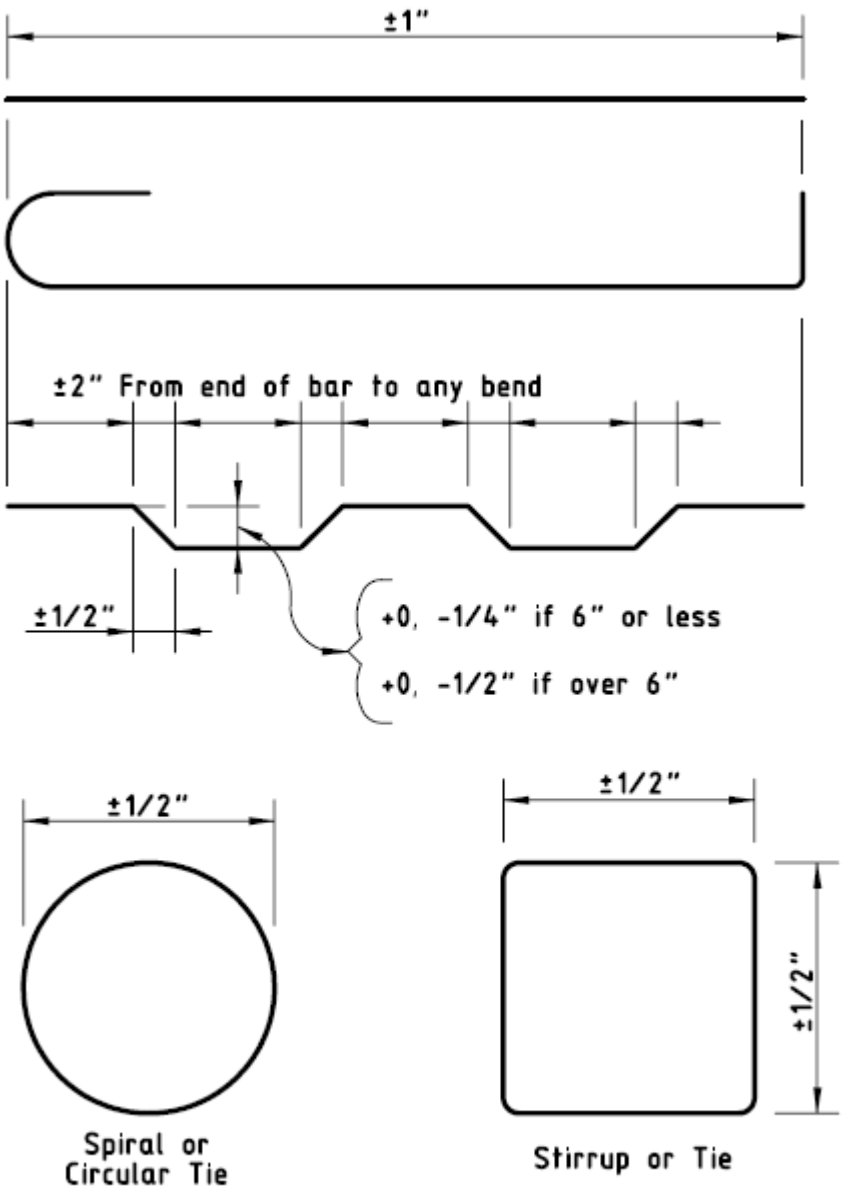

Figure 1
Fabrication tolerances for bars.

C. Storage. Store steel reinforcement above the ground on platforms, skids, or other supports, and protect it from damage and deterioration.

Ensure that reinforcement is free from dirt, paint, grease, oil, and other foreign materials when it is placed in the work. Use reinforcement free from defects such as cracks and delaminations. Rust, surface seams, surface irregularities, or mill scale will not be cause for rejection if the minimum cross-sectional area of a hand wire-brushed specimen meets the requirements for the size of steel specified.

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D. Splices. Lap-splice, weld-splice, or mechanically splice bars as shown on the plans. Additional splices not shown on the plans will require approval. Splices not shown on the plans will be permitted in slabs 15 in. or less in thickness, columns, walls, and parapets.

• Unless otherwise approved, splices will not be permitted in bars 30 ft. or less in plan length. For bars exceeding 30 ft. in plan length, the distance center-to-center of splices must be at least 30 ft. minus 1 splice length, with no more than 1 individual bar length less than 10 ft. Make lap splices not shown on the plans, but otherwise permitted, in accordance with Table 5. Maintain the specified concrete cover and spacing at splices, and place the lapspliced bars in contact, securely tied together.

Table 5
Minimum Lap Requirements for Bar Sizes through No. 11

Bar Size Number (in.)	Bar Size Number (mm)	Uncoated Lap Length	Coated Lap Length
3	10	1 ft. 4 in.	2 ft. 0 in.
4	13	1 ft. 9 in.	2 ft. 8 in.
5	16	2 ft. 2 in.	3 ft. 3 in.
6	19	2 ft. 7 in.	3 ft. 11 in.
7	22	3 ft. 5 in.	5 ft. 2 in.
8	25	4 ft. 6 in.	6 ft. 9 in.
9	29	5 ft. 8 in.	8 ft. 6 in.
10	32	7 ft. 3 in.	10 ft. 11 in.
11	36	8 ft. 11 in.	13 ft. 5 in.

Note: Bar size numbers (in.) are based on the number of eighths of an inch included in the nominal diameter of the bar. Bar size numbers (mm) approximate the number of millimeters included in the nominal diameter of the bar.

• Do not lap No. 14 or No. 18 bars.

• Lap spiral steel at least 1 turn.

• Splice welded wire fabric using a lap length that includes the overlap of at least 2 cross wires plus 2 in. on each sheet or roll.

Splices using bars that develop equivalent strength and are lapped in accordance with Table 5 are permitted.

• For box culvert extensions with less than 1 ft. of fill, lap the existing longitudinal bars with the new bars as shown in Table 3.

For extensions with more than 1 ft. of fill, lap at least 1 ft. 0 in.

• Ensure that welded splices conform to the requirements of the plans and of Item 448, “Structural Field Welding.” Field-prepare ends of reinforcing bars if they will be butt-welded. Delivered bars must be long enough to permit weld preparation.

• Install mechanical coupling devices in accordance with the manufacturer’s recommendations at locations shown on the plans.

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Protect threaded male or female connections, and make sure the threaded connections are clean when making the connection. Do not repair damaged threads.

• Mechanical coupler alternate equivalent strength arrangements, to be accomplished by substituting larger bar sizes or more bars, will be considered if approved in writing before fabrication of the systems.

E. Placing. Unless otherwise shown on the plans, dimensions shown for reinforcement are to the centers of the bars. Place reinforcement as near as possible to the position shown on the plans. In the plane of the steel parallel to the nearest surface of concrete, bars must not vary from plan placement by more than 1/12 of the spacing between bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars must not vary from plan placement by more than 1/4 in. Cover of concrete to the nearest surface of steel must be at least 1 in. unless otherwise shown on the plans.

For bridge slabs, the clear cover tolerance for the top mat of reinforcement is –0, +1/2 in.

Locate the reinforcement accurately in the forms, and hold it firmly in place before and during concrete placement by means of bar supports that are adequate in strength and number to prevent displacement and to keep the steel at the proper distance from the forms. Support bars by standard bar supports with plastic tips, approved plastic bar supports, or precast mortar or concrete blocks when supports are in contact with removable or stay-in-place forms. Use bright basic bar supports to support reinforcing steel placed in slab overlays on concrete panels or on existing concrete slabs. Bar supports in contact with soil or subgrade must be approved.

For bar supports with plastic tips, the plastic protection must be at least 3/32 in. thick and extend upward on the wire to a point at least 1/2 in. above the formwork.

All accessories such as tie wires, bar chairs, supports, or clips used with epoxy-coated reinforcement must be of steel, fully coated with epoxy or plastic. Plastic supports approved by the Engineer may also be used with epoxy-coated reinforcement.

Cast mortar or concrete blocks to uniform dimensions with adequate bearing area. Provide a suitable tie wire in each block for anchoring to the steel. Cast the blocks to the thickness required in approved molds.

The surface placed adjacent to the form must be a true plane, free of surface imperfections. Cure the blocks by covering them with wet burlap or mats for a period of 72 hr. Mortar for blocks should contain approximately 1 part hydraulic cement to 3 parts sand. Concrete for blocks should contain 850 lb. of hydraulic cement per cubic yard of concrete.

Place individual bar supports in rows at 4-ft. maximum spacing in each direction. Place continuous type bar supports at 4-ft. maximum spacing.

Use continuous bar supports with permanent metal deck forms.

The exposure of the ends of longitudinals, stirrups, and spacers used to position the reinforcement in concrete pipe and in precast box culverts or storm drains is not cause for rejection.

Tie reinforcing steel for bridge slabs, top slabs of direct traffic culverts, and top slabs of prestressed box beams at all intersections, except tie only alternate intersections where spacing is less than 1 ft. in each direction. For reinforcing steel cages for other structural members, tie the steel at enough intersections to provide a rigid cage of steel. Fasten mats of wire fabric securely at the ends and edges.

Before concrete placement, clean mortar, mud, dirt, debris, oil, and other foreign material from the reinforcement. Do not place concrete until authorized.

If reinforcement is not adequately supported or tied to resist settlement, reinforcement is floating upward, truss bars are overturning, or movement is detected in any direction during concrete placement, stop placement until corrective measures are taken.

F. Handling, Placement, and Repair of Epoxy-Coated Reinforcing

Steel.

1. Handling. Provide systems for handling coated reinforcement with padded contact areas. Pad bundling bands or use suitable banding to prevent damage to the coating. Lift bundles of coated reinforcement with a strongback, spreader bar, multiple supports, or a platform bridge. Transport the bundled reinforcement carefully, and store it on protective cribbing. Do not drop or drag the coated reinforcement.

2. Construction Methods. Do not flame-cut coated reinforcement.

Saw or shear-cut only when approved. Coat cut ends as specified in Section 440.3.F.3, “Repair of Coating.”

Do not weld or mechanically couple coated reinforcing steel except where specifically shown on the plans. Remove the epoxy coating at least 6 in. beyond the weld limits before welding and

2 in. beyond the limits of the coupler before assembly. After welding or coupling, clean the steel of oil, grease, moisture, dirt, welding contamination (slag or acid residue), and rust to a nearwhite finish. Check the existing epoxy for damage. Remove any damaged or loose epoxy back to sound epoxy coating.

After cleaning, coat the splice area with epoxy repair material to a thickness of 7 to 17 mils after curing. Apply a second application of repair material to the bar and coupler interface to ensure complete sealing of the joint.

3. Repair of Coating. For repair of the coating, use material that complies with the requirements of this Item and ASTM D 3963.

Make repairs in accordance with procedures recommended by the manufacturer of the epoxy coating powder. For areas to be patched, apply at least the same coating thickness as required for the original coating. Repair all visible damage to the coating.

Repair sawed and sheared ends, cuts, breaks, and other damage promptly before additional oxidation occurs. Clean areas to be repaired to ensure that they are free from surface contaminants.

Make repairs in the shop or in the field as required.

440.4. Measurement and Payment. The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but will be considered subsidiary to pertinent Items.

ITEM 500 - MOBILIZATION

500.1. Description. Establish and remove offices, plants, and facilities. Move personnel, equipment, and supplies to and from the project or the vicinity of the project site to begin work or complete work on Contract Items.

500.2. Measurement. This Item will be measured by the lump sum as the work progresses.

500.3. Payment. Partial payments of the lump sum bid for mobilization will be as follows. The adjusted Contract amount for construction Items as used below is defined as the total Contract amount less the lump sum for mobilization.

A. Payment will be made upon presentation of a paid invoice for the payment bond, performance bond, and required insurance. The combined payment for bonds and insurance will be no more than 10% of the mobilization lump sum or 1% of the total Contract amount, whichever is less.

B. Payment will be made upon verification of documented expenditures for plant and facility setup. The combined amount for all these facilities will be no more than 10% of the mobilization lump sum or 1% of the total Contract amount, whichever is less.

C. When 1% of the adjusted Contract amount for construction Items is earned, 50% of the mobilization lump sum bid or 5% of the total Contract amount, whichever is less, will be paid. Previous payments under this Item will be deducted from this amount.

D. When 5% of the adjusted Contract amount for construction Items is earned, 75% of the mobilization lump sum bid or 10% of the total

Contract amount, whichever is less, will be paid. Previous payments under the Item will be deducted from this amount.

E. When 10% of the adjusted Contract amount for construction Items is earned, 90% of the mobilization lump sum bid or 10% of the total

Contract amount, whichever is less, will be paid. Previous payments under this Item will be deducted from this amount.

F. Payment for the remainder of the lump sum bid for “Mobilization” will be made on the next estimate cycle after the initial retainage estimate or at final acceptance for projects without retainage.

ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING

502.1. Description. Provide, install, move, replace, maintain, clean, and remove upon completion of work all barricades, signs, cones, lights, and other traffic control devices used for traffic handling as indicated on the plans and as directed.

502.2. Construction. Provide traffic control devices that conform to details shown on the plans, the TMUTCD, and the Compliant Work Zone Traffic Control Device List (CWZTCDL) maintained by the Traffic Operations Division.

A. Implementation. Before beginning work, designate in writing a Contractor’s Responsible Person (CRP) to be the representative of the Contractor who is responsible for taking or directing corrective measures of installation and maintenance deficiencies as soon as possible. The CRP must be accessible by phone and able to respond to emergencies 24 hours per day.

Follow the traffic control plan (TCP) and install traffic control devices as shown on the plans and as directed. Install traffic control devices straight and plumb. Do not make changes to the location of any device or implement any other changes to the TCP without the approval of the Engineer. Minor adjustments to meet field constructability and visibility are allowed.

Submit Contractor-proposed TCP changes, signed and sealed by a licensed professional engineer, to the Engineer for approval. The Engineer may develop, sign, and seal Contractor-proposed changes.

Changes must conform to guidelines established in the TMUTCD using approved products from the CWZTCDL.

Maintain traffic control devices by taking corrective action as soon as possible. Corrective action includes but is not limited to cleaning, replacing, straightening, covering, or removing devices. Maintain the devices such that they are properly positioned, spaced, and legible, and that retroreflective characteristics meet requirements during darkness and rain.

B. Flaggers. Provide a Contractor representative who has been certified as a flagging instructor through courses offered by the Texas Engineering Extension Service, the American Traffic Safety Services Association, the National Safety Council, or other approved organizations. Provide the certificate indicating course completion when requested. This representative is responsible for training and assuring that all flaggers are qualified to perform flagging duties. A qualified flagger must be independently certified by one of the organizations listed above or trained by the Contractor's certified flagging instructor. Provide the Engineer with a current list of qualified flaggers before beginning flagging activities. Use only flaggers on the qualified list.

Flaggers must be courteous and able to effectively communicate with the public. When directing traffic, flaggers must use standard attire, flags, signs, and signals and follow the flagging procedures set forth in the TMUTCD.

C. Removal. Upon completion of work, remove all barricades, signs, cones, lights, and other traffic control devices used for work-zone traffic handling, unless otherwise shown on the plans.

502.3. Measurement. This Item will be measured by the month.

502.4. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Barricades, Signs, and Traffic Handling." This price is full compensation for installation, maintenance, adjustments, replacements, removal, materials, equipment, labor, tools, and incidentals.

When the plans establish pay items for particular work called for in the TCP, that work will be measured and paid for under pertinent Items.

A. Initiation of Payment. Payment for this Item will begin on the first estimate after barricades, signs, and traffic handling devices have been installed in accordance with the TCP and construction has begun.

Installation of the project limit advance warning signs alone is not considered the beginning of construction.

B. Paid Months. Monthly payment will be made each succeeding month for this Item provided the barricades, signs, and traffic handling devices have been installed and maintained in accordance with the TCP until the Contract amount has been paid.

If, within the time frame established by the Engineer, the Contractor fails to provide or properly maintain signs and barricades in compliance with the Contract requirements, as determined by the Engineer, the Contractor will be considered in noncompliance with this Item. No payment will be made for the months in question, and the total final payment quantity will be reduced by the number of months the Contractor was in noncompliance.

C. Maximum Total Payment Prior to Acceptance. The total payment for this Item will not exceed 10% of the total Contract amount before final acceptance in accordance with Article 5.8, "Final Acceptance."

However, when all work is complete for all project locations, except for work for tentative establishment and maintenance periods and performance and test periods, the 10% of the total Contract amount may be exceeded. The remaining balance will be paid in accordance with Section 502.4.E, “Balance Due.”

D. Total Payment Quantity. The quantity paid under this Item will not exceed the total quantity shown in the plans except as modified by change order and as adjusted by Section 502.4.B, “Paid Months.” An overrun of the plans quantity for this Item will not be allowed for approving designs; testing; material shortages; closed construction seasons; curing periods; establishment, performance, test, and maintenance periods; failure to complete the work in the number of months allotted; nor delays caused directly or indirectly by requirements of the contract.

E. Balance Due. If all work is complete and accepted in accordance with Article 5.8, “Final Acceptance,” before payment of the amount allowed by this Article, the balance due will be paid on the next estimate after the initial retainage release estimate or final acceptance for projects without retainage.

F. Law Enforcement. Law enforcement required by the Engineer will be paid in accordance with Article 9.5, “Force Account.”

ITEM 506 - TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS

506.1. Description. Install, maintain, and remove erosion, sedimentation, and environmental control devices. Remove accumulated sediment and debris.

506.2. Materials.

A. Rock Filter Dams.

1. Aggregate. Furnish aggregate with hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding acceptable to the Engineer. Provide the following:

• **Types 1, 2, and 4 Rock Filter Dams.** Use 3 to 6 in. aggregate.

• **Type 3 Rock Filter Dams.** Use 4 to 8 in. aggregate.

2. Wire. Provide minimum 20 gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams. Type 4 dams require:

• a double-twisted, hexagonal weave with a nominal mesh opening of 2-1/2 in. x 3-1/4 in.;

• minimum 0.0866 in. steel wire for netting;

• minimum 0.1063 in. steel wire for selvages and corners; and minimum 0.0866 in. for binding or tie wire.

3. Sandbag Material. Furnish sandbags meeting Section 506.2.I, “Sandbags,” except that any gradation of aggregate may be used to fill the sandbags.

B. Temporary Pipe Slope Drains. Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections that conform to the plans. Recycled and other materials meeting these requirements are allowed if approved.

Furnish concrete in accordance with Item 432, “Riprap.”

C. Baled Hay. Provide hay bales weighing at least 50 lb., composed entirely of vegetable matter, measuring 30 in. or longer, and bound with wire, nylon, or polypropylene string.

D. Temporary Paved Flumes. Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material that conforms to the plans. Provide rock or rubble with a minimum diameter of 6 in. and a maximum volume of 1/2 cu. ft. for the construction of energy dissipaters.

E. Construction Exits. Provide materials that meet the details shown on the plans and this Section.

1. Rock Construction Exit. Provide crushed aggregate for long and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft, or flaky materials and organic and injurious matter. Use 4- to 8-in. aggregate for Type 1 and 2- to 4-in. aggregate for Type 3.

2. Timber Construction Exit. Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots and treated to control rot. Fasten timbers with nuts and bolts or lag bolts, of at least 1/2 in. diameter, unless otherwise shown on the plans or allowed. For short-term exits, provide plywood or pressed wafer board at least 1/2 in. thick.

3. Foundation Course. Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.

F. Embankment for Erosion Control. Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.

G. Pipe. Provide pipe outlet material in accordance with Item 556, “Pipe Underdrains,” and details shown on the plans.

H. Construction Perimeter Fence.

1. Posts. Provide essentially straight wood or steel posts that are at least 60 in. long. Furnish soft wood posts with a minimum diameter of 3 in. or use 2 x 4 boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 x 1-1/5 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.3 lb. per foot.

2. Fence. Provide orange construction fencing as approved by the Engineer.

3. Fence Wire. Provide 12-1/2 gauge or larger galvanized smooth or twisted wire. Provide16 gauge or larger tie wire.

4. Flagging. Provide brightly-colored flagging that is fade-resistant and at least 3/4 in. wide to provide maximum visibility both day and night.

5. Staples. Provide staples with a crown at least 1/2 in. wide and legs at least 1/2 in. long.

6. Used Materials. Previously used materials meeting the applicable requirements may be used if accepted by the Engineer.

I. Sandbags. Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 oz. per square yard, a Mullen burst-strength exceeding 300 psi, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sandbags must be 24 to 30 in. long, 16 to 18 in. wide, and 6 to 8 in. thick.

Table 1
Sand Gradation

Sieve #	Maximum Retained (% by Weight)
4	3%
100	80%
200	95%

J. Temporary Sediment Control Fence. Provide a net-reinforced fence using woven geo-textile fabric. Logos visible to the traveling public will not be allowed.

1. Fabric. Provide fabric materials in accordance with DMS-6230, "Temporary Sediment Control Fence Fabric."

2. Posts. Provide essentially straight wood or steel posts with a minimum length of 48 in., unless otherwise shown on the plans.

Soft wood posts must be at least 3 in. in diameter or nominal 2 x 4 in. Hardwood posts must have a minimum cross-section of 1-1/2 x 1-1/2 in. T- or L-shaped steel posts must have a minimum weight of 1.3 lb. per foot.

3. Net Reinforcement. Provide net reinforcement of at least

12-1/2 gauge galvanized welded wire mesh, with a maximum opening size of 2 x 4 in., at least 24 in. wide, unless otherwise shown on the plans.

4. Staples. Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.

5. Used Materials. Use recycled material meeting the applicable requirements if accepted by the Engineer.

506.3. Equipment. Provide a backhoe, front end loader, blade, scraper, bulldozer, or other equipment as required when "Earthwork for Erosion Control" is specified on the plans as a bid item.

506.4. Construction.

A. Contractor Responsibilities. Implement the Department's Storm Water Pollution Prevention Plan (SWP3) for the project site in accordance with the specific or general storm water permit requirements. Develop and implement an SWP3 for project-specific material supply plants within and outside of the Department's right of way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water associated with construction activity from entering any surface water or private property on or adjacent to the project site.

B. General.

1. Phasing. Implement control measures in the area to be disturbed before beginning construction, or as directed. Limit the disturbance to the area shown on the plans or as directed. If, in the opinion of the Engineer, the Contractor cannot control soil erosion and sedimentation resulting from construction operations, the Engineer will limit the disturbed area to that which the Contractor is able to control. Minimize disturbance to vegetation.

2. Maintenance. Immediately correct ineffective control measures.

Implement additional controls as directed. Remove excavated material within the time requirements specified in the applicable storm water permit.

3. Stabilization. Stabilize disturbed areas where construction activities will be temporarily stopped in accordance with the applicable storm water permit. Establish a uniform vegetative cover. The project will not be accepted until a 70% density of existing adjacent undisturbed areas is obtained, unless otherwise shown on the plans. When shown on the plans, the Engineer may accept the project when adequate controls are in place that will control erosion, sedimentation, and water pollution until sufficient vegetative cover can be established.

4. Finished Work. Upon acceptance of vegetative cover, remove and dispose of all temporary control measures, temporary embankments, bridges, matting, falsework, piling, debris, or other obstructions placed during construction that are not a part of the finished work, or as directed.

5. Restricted Activities. Do not locate disposal areas, stockpiles, or haul roads in any wetland, water body, or streambed.

Do not install temporary construction crossings in or across any water body without the prior approval of the appropriate resource agency and the Engineer. Restrict construction operations in any water body to the necessary areas as shown on the plans or applicable permit, or as directed. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for stream crossings.

Provide protected storage area for paints, chemicals, solvents, and fertilizers at an approved location. Keep paints, chemicals, solvents, and fertilizers off bare ground and provide shelter for stored chemicals.

C. Installation, Maintenance, and Removal Work. Perform work in accordance with the specific or general storm water permit. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until earthwork construction and permanent erosion control features are in place or the disturbed area has been adequately stabilized as determined by the Engineer. If a device ceases to function as intended, repair or replace the device or portions thereof as necessary. Remove sediment, debris, and litter. When approved, sediments may be disposed of within embankments, or in the right of way in areas where the material will not contribute to further siltation. Dispose of removed material in accordance with federal, state, and local regulations.

Remove devices upon approval or when directed. Upon removal, finish-grade and dress the area. Stabilize disturbed areas in accordance with the permit, and as shown on the plans or directed. The Contractor retains ownership of stockpiled material and must remove it from the project when new installations or replacements are no longer required.

1. Rock Filter Dams for Erosion Control. Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.

For Types 1, 2, 3, and 5, place the aggregate to the lines, height, and slopes specified, without undue voids. For Types 2 and 3, place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties, or hog rings, or as directed. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams according to the following criteria, unless otherwise shown on the plans:

a. Type 1 (Non-reinforced).

(1) Height. At least 18 in. measured vertically from existing ground to top of filter dam.

(2) Top Width. At least 2 ft.

(3) Slopes. At most 2:1.

b. Type 2 (Reinforced).

(1) Height. At least 18 in. measured vertically from existing ground to top of filter dam.

(2) Top Width. At least 2 ft.

(3) Slopes. At most 2:1.

c. Type 3 (Reinforced).

(1) Height. At least 36 in. measured vertically from existing ground to top of filter dam.

(2) Top Width. At least 2 ft.

(3) Slopes. At most 2:1.

d. Type 4 (Sack Gabions). Unfold sack gabions and smooth out kinks and bends. For vertical filling, connect the sides by lacing in a single loop–double loop pattern on 4- to 5-in. spacing. At one end, pull the end lacing rod until tight, wrap around the end, and twist 4 times. At the filling end, fill with stone, pull the rod tight, cut the wire with approximately 6 in. remaining, and twist wires 4 times.

For horizontal filling, place sack flat in a filling trough, fill with stone, and connect sides and secure ends as described above.

Lift and place without damaging the gabion. Shape sack gabions to existing contours.

e. Type 5. Provide rock filter dams as shown on the plans.

2. Temporary Pipe Slope Drains. Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in 8-in. lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least 1 ft. higher than the top of the inlet pipe at all points. Secure the pipe with hold-downs or hold-down grommets spaced a maximum of 10 ft. on center. Construct the energy dissipators or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, “Riprap,” when designated on the plans.

3. Baled Hay for Erosion and Sedimentation Control. Install hay bales at locations shown on the plans by embedding in the soil at least 4 in. and, where possible, approximately 1/2 the height of the bale, or as directed. Fill gaps between bales with hay.

4. Temporary Paved Flumes. Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans, unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above to a minimum depth of 9 in. at the flume outlet to the limits shown on the plans or as directed.

5. Construction Exits. When tracking conditions exist, prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction exits. Construct exits for either long or short-term use.

a. Long-Term. Place the exit over a foundation course, if necessary. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans

or as directed. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed.

(1) Type 1. Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.

(2) Type 2. Construct using railroad ties and timbers as shown on the plans or as directed.

b. Short-Term.

(1) Type 3. Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.

(2) Type 4. Construct as shown on the plans or as directed.

6. Earthwork for Erosion Control. Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.

a. Excavation and Embankment for Erosion Control

Features. Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed.

Where required, create a sediment basin providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at one time, not including offsite areas.

b. Excavation of Sediment and Debris. Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.

7. Construction Perimeter Fence. Construct, align, and locate fencing as shown on the plans or as directed.

a. Installation of Posts. Embed posts 18 in. deep or adequately anchor in rock, with a spacing of 8 to 10 ft.

b. Wire Attachment. Attach the top wire to the posts at least 3 ft. from the ground. Attach the lower wire midway between the ground and the top wire.

c. Flag Attachment. Attach flagging to both wire strands midway between each post. Use flagging at least 18 in. long.

Tie flagging to the wire using a square knot.

8. Sandbags for Erosion Control. Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top 6 in. of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags 1/2 the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.

9. Temporary Sediment-Control Fence. Provide temporary sediment-control fence near the down-stream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, as specified in this Section, or as directed.

a. Installation of Posts. Embed posts at least 18 in. deep, or adequately anchor, if in rock, with a spacing of 6 to 8 ft. and install on a slight angle toward the run-off source.

b. Fabric Anchoring. Dig trenches along the uphill side of the fence to anchor 6 to 8 in. of fabric. Provide a minimum trench cross-section of 6 x 6 in. Place the fabric against the side of the trench and align approximately 2 in of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.

c. Fabric and Net Reinforcement Attachment. Unless otherwise shown under the plans, attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced. Sewn vertical pockets may be used to attached reinforcement to end posts. Fasten the fabric to the top strand of reinforcement by hog rings or cord every 15 in. or less.

d. Fabric and Net Splices. Locate splices at a fence post with a minimum lap of 6 in. attached in at least 6 places equally spaced, unless otherwise shown under the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment control fence include the following:

• fabric with minimal or no visible signs of biodegradation (weak fibers),

• fabric without excessive patching (more than 1 patch every 15 to 20 ft.),

• posts without bends, and

• backing without holes.

506.5. Measurement.

A. Rock Filter Dams. Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags, when used.

1. Linear Measurement. When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.

2. Volume Measurement. When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.

a. Installation. Measurement will be made in final position.

b. Removal. Measurement will be made at the point of removal.

B. Temporary Pipe Slope Drains. Temporary pipe slope drains will be measured by the foot.

C. Baled Hay. Baled hay will be measured by each bale.

D. Temporary Paved Flumes. Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.

E. Construction Exits. Construction exits will be measured by the square yard of surface area.

F. Earthwork for Erosion Control.

1. Equipment. Equipment use will be measured by the actual number of hours the equipment is operated.

2. Volume Measurement.

a. In Place.

(1) Excavation. Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.

(2) Embankment. Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:

• the original ground surfaces or the surface upon that the embankment is to be constructed for the feature

and

• the lines, grades and slopes of the accepted embankment for the feature.

b. In Vehicles. Excavation and embankment quantities will be combined and paid for under “Earthwork (Erosion and Sediment Control, In Vehicles).” Excavation will be measured by the cubic yard in vehicles at the point of removal.

Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.

G. Construction Perimeter Fence. Construction perimeter fence will be measured by the foot.

H. Sandbags for Erosion Control. Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.

I. Temporary Sediment-Control Fence. Temporary sediment-control fence will be measured by the foot.

506.6. Payment. The following will not be paid for directly but are subsidiary to pertinent Items:

• erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (such as construction and haul roads, field offices, equipment and supply areas, plants, and material sources);

• removal of litter;

• repair to devices and features damaged by Contractor operations;

• added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;

• removal and reinstallation of devices and features needed for the convenience of the Contractor;

• finish grading and dressing upon removal of the device; and

• minor adjustments including but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

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The Contractor will be reimbursed in accordance with pertinent Items or Article 9.5, “Force Account,” for maintenance, repair, or reinstallation of devices and features when the need for additional control measures cannot be attributed to the above, as determined by the Engineer. Stabilization of disturbed areas will be paid for under pertinent Items.

Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly but is subsidiary to the excavation and embankment under this Item.

A. Rock Filter Dams. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid as follows:

1. Installation. Installation will be paid for as “Rock Filter Dams (Install)” of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

2. Removal. Removal will be paid for as “Rock Filter Dams (Remove).” This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

When the Engineer directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for “Rock Filter Dams (Remove)” and for “Rock Filter Dams (Install)” of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals

B. Temporary Pipe Slope Drains. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Temporary

Pipe Slope Drains” of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals.

Removal of temporary pipe slope drains will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for “Temporary Pipe Slope

Drains” of the size specified, which is full compensation for the removal and reinstallation of the pipe drain.

Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under Section 506.5.F, “Earthwork for Erosion and Sediment Control.”

Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432, “Riprap.”

C. Baled Hay. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Baled Hay.” This price is full compensation for furnishing and placing bales, excavating trenches, removal and disposal, equipment, labor, tools, and incidentals.

When the Engineer directs that the baled hay installation (or portions thereof) be replaced, payment will be made at the unit price bid for “Baled Hay,” which is full compensation for removal and reinstallation of the baled hay.

D. Temporary Paved Flumes. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Temporary Paved Flume (Install)” or “Temporary Paved Flume (Remove).” This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals.

When the Engineer directs that the paved flume installation or portions thereof be replaced, payment will be made at the unit prices bid for “Temporary Paved Flume (Remove)” and “Temporary Paved Flume (Install).” These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals.

Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under Section 506.5.F, “Earthwork for Erosion and Sediment Control.”

E. Construction Exits. Contractor-required construction exits from offright of way locations or on-right of way PSLs will not be paid for directly but are subsidiary to pertinent Items.

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” for construction exits needed on right of way access to work areas required by the Department will be paid for at the unit price bid for “Construction Exits (Install)” of the type specified or “Construction Exits (Remove).” This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals.

When the Engineer directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for “Construction Exit (Remove)” and “Construction Exit (Install)” of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals.

Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under Section 506.5.F, “Earthwork for Erosion and Sediment Control.”

F. Earthwork for Erosion and Sediment Control. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Excavation (Erosion and Sediment Control, In Place),” “Embankment (Erosion and Sediment Control, In Place),” “Earthwork (Erosion and Sediment Control, In Vehicles),” “Dragline Work (Erosion and Sediment Control),” “Backhoe Work (Erosion and Sediment Control),” “Excavator Work (Erosion and Sediment Control),” “Front End Loader Work (Erosion and Sediment Control),” “Blading Work (Erosion and Sediment Control),” “Scraper Work (Erosion and Sediment Control),” or “Bulldozer Work (Erosion and Sediment Control).”

This price is full compensation for excavation including removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project; excavation for construction of erosion-control features; embankments including furnishing material from approved sources and construction of erosion-control features; sandbags; plywood; stage construction for curb inlets involved in curb-inlet sediment traps; and equipment, labor; tools, and incidentals.

Earthwork needed to remove and obliterate of erosion-control features will not be paid for directly but is subsidiary to pertinent Items unless otherwise shown on the plans.

Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

G. Construction Perimeter Fence. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Construction Perimeter Fence.” This price is full compensation for furnishing and placing the fence; digging, fence posts, wire, and flagging; removal and disposal; and materials, equipment, labor, tools, and incidentals.

Removal of construction perimeter fence will be not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the perimeter fence installation or portions thereof be removed and replaced, payment will be made at the unit price bid for “Construction

Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

H. Sandbags for Erosion Control. Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals.

Removal of sandbags will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.

I. Temporary Sediment-Control Fence. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for

"Temporary Sediment-Control Fence." This price is full compensation for furnishing and placing the fence; trenching, fence posts, fabric and backfill; removal and disposal; and equipment, labor, tools, and incidentals.

Removal of temporary sediment-control fence will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the temporary sedimentation control fence installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Sediment-Control Fence," which is full compensation for the removal and reinstallation of the temporary sediment-control fence.

ITEM 529 - CONCRETE CURB, GUTTER, AND COMBINED CURB AND GUTTER

529.1. Description. Construct hydraulic cement concrete curb, gutter, and combined curb and gutter.

529.2. Materials. Furnish materials conforming to:

• Item 360, "Concrete Pavement"

• Item 420, "Concrete Structures"

• Item 421, "Hydraulic Cement Concrete"

• Item 440, "Reinforcing Steel."

Use Class A concrete or material specified in the plans. Use Grade 8 coarse aggregate for extruded Class A concrete. Use other grades if approved by the Engineer.

529.3. Construction. Provide finished work with a well-compacted mass and a surface free from voids and honeycomb, in the required shape, line, and grade. Round exposed edges with an edging tool of the radius shown on the plans. Mix, place, and cure concrete in accordance with Item 420, "Concrete Structures." Construct joints at locations shown on the plans.

Cure for at least 72 hr.

Furnish and place reinforcing steel in accordance with Item 440, "Reinforcing Steel."

Set and maintain a guideline that conforms to alignment data shown on the plans, with an outline that conforms to the details shown on the plans.

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A. Conventionally Formed Concrete. Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross section shown on the plans. Lightly sprinkle subgrade or foundation material immediately before concrete placement.

Pour concrete into forms, and strike off with a template 1/4 to 3/8 in. less than the dimensions of the finished curb unless otherwise approved. After initial set, plaster surface with mortar consisting of 1 part hydraulic cement and 2 parts fine aggregate. Brush exposed surfaces to a uniform texture.

Place curbs, gutters, and combined curb and gutters in 50-ft. maximum sections unless otherwise approved.

B. Extruded or Slipformed Concrete. Hand-tamp and sprinkle subgrade or foundation material before concrete placement. Provide clean surfaces for concrete placement. If required, coat cleaned surfaces with approved adhesive or coating at the rate of application shown on the plans or as directed. Place concrete with approved self-propelled equipment.

The forming tube of the extrusion machine or the form of the slipform machine must be easily adjustable vertically during the forward motion of the machine to provide variable heights necessary to conform to the established gradeline.

Attach a pointer or gauge to the machine so that a continual comparison can be made between the extruded or slipform work and the grade guideline. Other methods may be used when approved.

Finish surfaces immediately after extrusion or slipforming.

529.4. Measurement. This Item will be measured by the foot.

529.5. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Concrete Curb,” “Concrete Curb (Mono),” or “Concrete Curb and Gutter” of the type specified. This price is full compensation for surface preparation of base, equipment, labor, materials, tools, and incidentals.

ITEM 531 - SIDEWALKS

531.1. Description. Construct hydraulic cement concrete sidewalks.

531.2. Materials. Furnish materials conforming to the following:

• Item 360, “Concrete Pavement”

• Item 420, “Concrete Structures”

• Item 421, “Hydraulic Cement Concrete”

• Item 440, “Reinforcing Steel.”

Use Class A concrete or other concrete as specified. Use Grade 8 course aggregate for extruded Class A concrete. Use other grades if approved by the Engineer.

531.3. Construction. Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross-section shown on the plans.

Lightly sprinkle subgrade or foundation material immediately before concrete placement. Hand-tamp and sprinkle foundation when placement is directly on subgrade or foundation materials. Remove and dispose of existing concrete in accordance with Item 104, “Removing Concrete.”

Provide a clean surface for concrete placement directly on the surface material or pavement.

Mix and place concrete in accordance with the pertinent Items. Handfinishing is allowed for any method of construction. Finish exposed surfaces to a uniform transverse broom finish surface. Curb ramps must include a detectable warning surface and conform to details shown on the plans.

Install joints as shown on the plans. Brush all exposed surfaces to a smooth and uniform surface. Ensure that abrupt changes in sidewalk elevation do not exceed 1/4 inch, sidewalk cross slope does not exceed 2%, curb ramp grade does not exceed 8.3%, and flares adjacent to the ramp do not exceed 10% slope. Where a sidewalk crosses a concrete driveway, ensure that the sidewalk depth and reinforcement are not less than the driveway crosssectional details shown on the plans.

Provide finished work with a well-compacted mass, a surface free from voids and honeycomb, and the required true-to-line shape and grade. Cure for at least 72 hr. in accordance with Item 420, “Concrete Structures.”

A. Conventionally Formed Concrete. Provide sidewalk sections separated by premold or board joint of the thickness shown on the plans in lengths greater than 8 ft. but less than 40 ft., unless otherwise directed. Terminate workday production at an expansion joint.

B. Extruded or Slipformed Concrete. Provide any additional surface finishing immediately after extrusion or slipforming as required on the plans. Construct joints at locations as shown on the plans or as directed.

531.4. Measurement. Sidewalks will be measured by the foot or by the square yard of surface area. Curb ramps will be measured by each unit. The unit will consist of the curb ramp, landing, adjacent flares or side curb, and detectable warning surface as shown on the plans.

531.5. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Concrete Sidewalks” of the width (for foot measurement) and of the depth specified or “Curb Ramps” of the type specified. This price is full compensation for surface preparation of base; materials; removal and disposal of existing concrete; excavation, hauling and disposal of excavated material; drilling and doweling into existing concrete curb, sidewalk, and pavement; repair of adjacent street or pavement structure damaged by these operations; and equipment, labor, materials, tools, and incidentals.

Sidewalks that cross and connect to concrete driveways or turnouts will be measured and paid for in accordance with Item 530, “Intersections, Driveways, and Turnouts.”

ITEM NO. 201S - SUBGRADE PREPARATION 8-20-07

201S.1 - Description

This item shall govern scarifying; blading and rolling the subgrade to obtain a uniform texture and provide as nearly as practicable a uniform density for the top 6 inches (150 mm) of the subgrade.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

201S.2 - Submittals

The submittal requirements of this specification item may include:

A. A plan identifying classification and characteristics (P.I., optimum moisture-density, etc.) of insitu subgrade soils, as well as the source, classification and characteristics of any proposed borrow material,

B. Type and size of equipment proposed to produce the required compaction, and

C. Compaction (moisture-density, etc) test results for in-situ subgrade soils and/or borrow materials.

201S.3 - Construction Methods

Prior to initiation of subgrade preparation activities, all operations involving Standard Specification Item No. 101S," Preparing Right of Way" and/or Standard Specification Item No. 102S, "Clearing and Grubbing" shall be completed. The surface of the subgrade shall be scarified and shaped in conformity with the typical sections and the lines and grades indicated on the Drawings; by the removal of existing material or addition of approved material as established by the Engineer or designated representative. Any deviation in the subgrade cross section which exceeds ½ inch in a length of 10 feet (12 mm in a length of 3 meters), measured longitudinally, shall be corrected by loosening, adding or removing material, and then reshaping and compacting by sprinkling and rolling.

All unsuitable material shall be removed and replaced with approved material. All foundations, walls or other objectionable material shall be removed in accordance with Standard Specification Item No. 104S, "Removing Portland Cement Concrete" to a minimum depth of 18 inches (450 mm) under all structures and 12 inches (300 mm) under areas to be vegetated. All holes, ruts and depressions shall be filled with approved material and compacted by approved methods.

The subgrade shall be prepared sufficiently in advance to insure satisfactory prosecution of the Work. The Contractor will be required to set blue tops for the subgrade on the centerline, at the quarter points and along the curb lines or edge of pavement at maximum intervals of 50 feet (15 meters). The subgrade shall be tested by proof rolling in conformity with Standard Specification Item No. 236S, "Proof Rolling" prior to placement of the first course of base material. Any unstable or spongy subgrade areas identified by proof rolling shall be corrected either by additional reworking, drying and compaction, or by removal and replacement of unsuitable materials. When specifically directed by the Engineer or designated representative, the Contractor shall re-work the subgrade* as follows:

A. Remove the unstable subgrade to the full depth of the unstable insitu material or to a minimum depth of 6 inches (150 mm), whichever is greater;

B. Spread the material over a sufficient area to allow reworking of the excavated material;

C. Disc, scarify or otherwise breakup the excavated material and allow to dry (Note: If approved by the Engineer or designated representative, the addition of lime or other additive may be used to aid in the drying process or to stabilize the unstable material);

D. Fill the excavated area with the re-worked material and compact to specified densities; and

E. Proof roll the re-worked area.

* The Rework process will not be allowed for unstable organic subgrade soils. These type soils will be permanently removed and replaced with materials approved by the Engineer or designated representative.

All suitable material removed in accordance with Standard Specification Item No, 111S, "Excavation", may be utilized in the subgrade with the approval of the Engineer or designated representative. All other material required for completion of the Subgrade, including those defined in accordance with Specification Item No. 130S, "Borrow", shall also be subject to approval by the Engineer or designated representative.

It is the intent of this specification to provide the required density and moisture control for the subgrade based on the plasticity characteristics of the approved materials. The subgrade materials shall be sprinkled as required and compacted to the extent necessary to provide the density specified below, unless otherwise indicated on the Drawings. The Plasticity Index (P.I.) will be established in accordance with TxDOT Test Methods Tex-104-E, Tex-105-E and Tex-106-E. The density determination will be made in accordance with TxDOT Test Method Tex-114-E and field density measurements will be made in accordance with TxDOT Test Method Tex-115-E.

Description	Density, Percent	Moisture
Non-swelling Soils (P.I. less than 20)	Not less than 95	
Swelling Soils (P.I. between 20 and 35)	Not less than 95 nor more than 102	Not less than optimum
Swelling Soils (P.I. greater than 35)	Not less than 95 nor more than 100	Not less than optimum

Subgrade materials on which planting or turf will be established shall be compacted to a minimum of 85 percent of the density as determined in accordance with TxDOT Test Method Tex-114-E. Field tests for density in accordance with TxDOT Test Method Tex-115-E will be made as soon as possible after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to obtain the density required.

Prior to placement of any base materials, the in-place density and moisture content of the top 6 inches (150 mm) of compacted subgrade shall be checked. If the tests indicate that the relative density and moisture do not meet the limits specified in the table above, the subgrade shall be reworked as necessary to obtain the specified compaction and moisture content. All initial testing will be paid for by the City of Austin. All retesting shall be paid for by the Contractor.

201S.4 - Measurement

All acceptable subgrade preparation when included in the contract as a separate pay item, will be measured by the square yard (square meter: 1 square meter equals 1.196 Square yards). The measured area includes the entire width of the roadway for the entire length as indicated on the Drawings.

201S.5 - Payment

The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used when specified as a separate pay item in the contract bid form, subgrade preparation shall be measured as specified above and paid for at the contract unit bid price for "Subgrade Preparation". The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

Payment, when included as a contract pay item, will be made under:

Pay Item No. 201S:	Subgrade Preparation	Per Square Yard.

ITEM NO. 236S - PROOF ROLLING 8-20-07

236S.1 - Description

This item shall govern furnishing and operating heavy pneumatic tired compaction equipment for locating unstable areas of embankment, subgrade and flexible base courses.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, the inch-pound units are given preference followed by SI units shown within parentheses.

236S.2 - Submittals

The submittal requirements of this specification item may include:

A. A plan describing the condition of each roller proposed for the work, as well as the type of traction (self propelled or drawn), Type of roller, size, weight, tire pressure (if appropriate) and configuration of each individual roller, and

B. The operating speed proposed for each individual roller.

236S.3 - Equipment

A. Standard Proof Roller:

The proof rolling equipment shall have a loading platform or body suitable for ballast loading that is supported on a minimum of two (2) axles with not more than two (2) pneumatic tired wheels per axle. All wheels shall be arranged so that they will carry approximately equal loads when operating on uneven surfaces. Pneumatic proof rolling equipment with multiple pivotal axles and more than two tires along the front or rear axle axis shall have articulating axle supports to equally distribute the load to all tires over uneven surfaces.

The proof roller unit, under working conditions, shall have a minimum contact width of 7½ feet (2.3 meters) and shall be so designed that the gross roller weight may be varied uniformly from 25 tons to 50 tons (23 megagrams to 45 megagrams) by ballast loading. The tires shall be capable of operating under various loads with variable air pressures up to 145 psi (up to 1000 kiloPascals). The tires shall be smooth tread and shall impart a minimum ground contact pressure of 75 pounds per square inch (520 kiloPascals). Tires shall be practically full of liquid (i.e. when liquid will flow from the valve stem of a fully inflated tire with the stem in the uppermost position). The operating load and tire pressure shall be within the range of the manufacturer's chart as directed by the Engineer or designated representative.

The proof roller shall be drawn by a power train of adequate tractive effort or may be of a self-propelled type. The proof rolling equipment shall be equipped with a reverse mode transmission or be capable of turning 180 degrees in the street width. When a separate power train is used to draw the proof roller, the power train weight shall not be considered in the weight of the proof roller. The power train shall be rubber-tired when rolling subgrade and base materials. A cleated or track-type power train may be used on earth and rock embankments.

B. Alternate Equipment:

With the written approval of the Engineer or designated representative, the Contractor may utilize alternate equipment on embankment courses, subgrade and base courses subject to the requirements of the standard proof roller except with respect to minimum contact width, axle/tire arrangement and tire tread.

Alternate equipment for stability testing of embankments shall be restricted to equipment that can be shown to impart a stress distribution on the embankment structure equivalent to or greater than the stress induced by the concentrated weight of a standard proof roller.

C. Equipment Submittals:

All standard proof rollers and proposed alternate equipment must be approved by the Engineer or designated representative prior to their use. The Contractor shall furnish the Engineer or designated representative with charts or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished.

Alternate equipment submittals for proof rolling of embankments shall be signed and sealed by a registered Professional Engineer licensed in the State of Texas.

236S.4 - Construction Methods

A. General:

Within the ranges set forth in Section 236S.3, the load and tire inflation pressures shall be adjusted as directed by the Engineer or designated representative. It is proposed to use a contact pressure corresponding as nearly as practical to the maximum supporting value of the earthwork or base. The entirety of prepared surfaces to be tested by this method shall be proof rolled by a minimum of two passes of the proof roller tires. Each succeeding trip of the proof roller shall be offset by not greater than one tire width.

When alternate equipment is proposed and only one axle meets minimum requirements, only the qualifying axle shall be used to proof roll. If the operation of the proof roller shows an area to be unstable, the substandard area shall be brought to satisfactory stability and uniformity by additional curing, compaction, or by removal and replacement of unsuitable materials. The re-worked area shall then be proof rolled.

Proof rollers shall be operated at speeds between 2 and 6 miles per hour (3 and 10 kilometers per hour) or as directed by the Engineer or designated representative.

Acceptable limits of elastic and plastic deformation of prepared subgrade courses shall be established by proof rolling Test Sections of representative soil conditions, previously tested and approved for density and moisture requirements of the governing subgrade and earth embankment items. Proof rolling of first course base over a plastic subgrade may be waived by the Engineer or designated representative if it is determined that the prepared first course base will be damaged by the proof roller.

B. Roadway Construction:

The subgrade and all lifts of base material shall be proof rolled in new roadway construction and in the reconstruction of existing streets. Proof rolling of the curb course base shall be substituted for proof rolling of final course base at the direction of the Engineer or designated representative. Proof rolling may be waived by the Engineer or designated representative where construction is limited to turn lanes, street widening less than 7½ feet (2.3 meters) in width, or where the site is otherwise congested.

C. Trenches:

Trenches shall be proof rolled where no limitations to the operation of the proof roller exist as may be determined by the Engineer subject to the provisions hereunder.

All trenches shall be proof rolled in new roadways or in existing roadways under reconstruction. Trenches shall be proof rolled at the street subgrade elevation by longitudinal and perpendicular passes of the roller as may be dictated by the width of the trench.

Proof rolling of trenches in existing paved streets shall be limited to pavement cross-sections capable of sustaining the weight of the proof rolling equipment without imparting damage to the remaining pavement structure as determined by the Engineer. Trenches less than 4 feet (1.2 meters) in width shall be exempted of all proof rolling requirements. Only the final course base shall be proof rolled in trenches 4 feet (1.2 meters) or wider but narrower than the proof roller contact width. The subgrade, the first course and the final course base shall be proof rolled in trenches 7½ feet (2.3 meters) or wider.

D. Embankment Construction:

All embankment courses shall be proof rolled, unless otherwise directed by the Engineer or designated representative.

If required by the Engineer or designated representative, stability testing of embankments constructed to the finished cross-section and elevation or to interim elevations shall either be conducted with a standard proof roller or alternate equipment, which can be proven to impart a horizontal and vertical pressure distributions equivalent to or greater than those induced by a standard proof roller.

236S.5 - Measurement and Payment

No direct payment will be made for the materials, equipment or labor required by this item, but shall be included in the unit price bid for the item of construction in which this item is used.

TESTING SCHEDULE

Description:	Rate:	Testing Standard:
Soils:		
Moisture Content of Soil Materials	Per Material Source	TEX-103-E
Density – Raw Subgrade**	Per 100 LF Road per Lift	TEX-115-E

** Testing must be conducted during backfill operations

Concrete (Unconfined Compression, 7 & 28 Day):		
Curb and Gutter/Valley Gutter	Per 1000 LF	TEX-418-A
Concrete Pavement - Strength	Per 4000 SF	TEX-418-A
Temperature	At time and location strength specimens are made	TEX-422-A
Air, Slumps & Compression - In Place	Per Exposed Structure	TEX-414-A, TEX-415-A, TEX-418-A
Slump & Compression - In Place	Per Underground Structure	TEX-415-A, TEX-418-A

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SECTION 31 05 00 - STRUCTURAL EARTHWORK FOR BUILDING FOUNDATION

PART 1 - GENERAL

1 WORK INCLUDED

A. Fill under slabs-on-grade.

B. Shoring excavation.

2 RELATED WORK

A. Section 01 40 00 – Basic Requirements: Inspection of bearing surfaces.

B. Section 31 23 23.15 – Compaction Control and Testing for Building Foundations

3 REFERENCES

A. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D-698 Compaction Test.

4 PROTECTION

A. Protect trees, shrubs, lawns, rock outcropping, and other features remaining as a portion of final landscaping.

B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.

C. Protect above and below grade utilities which are to remain.

D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

E. Excavations greater that 5'0" deep shall be designed by an Engineer registered in the State of Texas and meet all requirements of state and federal statues for trench safety.

F. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

G. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

H. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

I. Grade excavation top perimeter to prevent surface water run-off into excavation.

5 TESTS

A. Tests and analysis of fill materials will be performed in accordance with ASTM D-698 or TEX 113-E and under provisions of Section 01 40 00.

6 SAMPLES

A. Submit samples under provisions of Section 01 33 00. Fill to testing laboratory, in air-tight containers.

PART 2 - PRODUCTS

1 SELECT FILL MATERIALS

A. Type A - Structural Fill: Crushed natural stone; meeting the specification noted on Plans.

PART 3 - EXECUTION

1 INSPECTION

A. Verify stockpiled fill to be reused is approved.

B. Verify foundation or foundation walls are braced to support surcharge forces imposed by backfilling operations.

C. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen.

2 PREPARATION

A. Identify required lines, levels, contours, and datum. Coordinate with Section 01 31 00.

B. Identify known underground utilities. Stake and flag locations.

C. Identify and flag surface and aerial utilities.

D. Notify utility company to remove and relocate utilities.

E. Maintain and protect existing utilities remaining which pass through work area.

F. When necessary, compact subgrade surfaces to density requirements for backfill material.

G. Cut out soft areas of subgrade not readily capable of in-situ compaction.

3 EXCAVATION

A. Excavate subsoil from lawn and parking area to lines and grades established by the Site Grading Plans.

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B. Exposed subgrades should be thoroughly proofrolled in order to locate and densify any weak, compressible zones. A minimum of 5 passes of a fully-loaded dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. The Geotechnical Engineer or his representative to document subgrade condition and preparation should observe Proofrolling operations. Weak or soft areas identified during proofrolling should be removed and replaced with suitable, compacted on-site clays, free of organics, oversized materials, and degradable or deleterious materials.
C. Excavation shall not interfere with normal 45 degree bearing splay of any foundation.
D. Hand trim excavation and leave free of loose matter.
E. Remove lumped subsoil, boulders, and rock.
F. Correct unauthorized excavation at no cost to Owner.
G. Fill over-excavated areas under structure bearing surfaces by filling with concrete in accordance with direction by Architect/Engineer.

4 BACKFILLING

A. Upon completion of the proofrolling operations and just prior to fill placement of slab construction, the exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 in. and recompacting to a minimum of 95 percent of the maximum density determined from ASTM D-698, Compaction Test. The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum moisture content until permanently covered.
B. Backfill areas to contours and elevations. Use unfrozen materials.
C. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.
D. Place and compact fill materials in continuous layers not exceeding 8 inches loose depth.
E. Employ a placement method so not to disturb or damage foundation dampproofing.
F. Maintain optimum moisture content of backfill materials, within 2% to attain required compaction density.
G. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
H. Slope grade away from building minimum 2 inches in 10 feet unless noted otherwise.
I. Make changes in grade gradual. Blend slopes into level areas.
J. Remove surplus backfill materials from site.
K. Leave stockpile areas completely free of excess fill materials.

5 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one inch.

6 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces under provisions of Section 01 1000.
B. Provide for visual inspection of bearing surfaces.
C. Compaction testing will be performed in accordance with ASTM D-698 and under provisions of Section 01 4000.
D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

7 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

8 SCHEDULE OF LOCATIONS

A. Building Pad – As required to meet General Notes

END OF SECTION

SECTION 31 23 23.15 - COMPACTION CONTROL AND TESTING FOR BUILDING FOUNDATIONS

PART 1 - GENERAL

1 WORK INCLUDED

A. Materials, labor, and equipment necessary to provide compaction of existing or imported soils.

B. Areas included: building foundations, slabs, sidewalks and paving.

2 REFERENCES

A. Texas State Department of Highways and Public Transportation (TSDHPT) Test Method TEX 113-E

B. ANSI/ASTM D698

3 SUBMITTALS

A. Testing Laboratory shall submit 3 copies of Moisture/Density Curves for each soil type.

B. Testing Laboratory shall submit 3 copies of Field Density Reports for each test performed.

4 QUALITY CONTROL

A. Testing Laboratory shall be allowed to secure necessary samples of proposed soil types for testing to insure conformance to specification requirements.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

1 Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.

2 Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with applicable procedures.

3 Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

4 Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

5 Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

6 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

B. Perform field density tests in accordance with ASTM D698 and TDH TEX-113-E, as applicable.

C. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Architect.

7 If in opinion of Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

END OF SECTION

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SECTION 32 84 00 – IRRIGATION SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Furnish all work and materials, appliances, tools, equipment, facilities, transportation, point of connection and all other services required for the installation of a complete underground permanent, as shown on drawings and/or specified herein. When the term "Contractor" is used in this section, it shall refer to the Irrigation Contractor.

1.2 QUALITY ASSURANCE

A. The following Codes, Regulations, Reference Standards, and Specifications apply to work included in this section: ASTM: D2241, D2464, D2466, D2564, and D855.

1.3 WARRANTY AND MAINTENANCE

A. The Contractor shall warranty material and workmanship for one year after final acceptance including repair and replacement of defective materials, workmanship, and labor.

B. Maintenance during warranty shall include, but not necessarily be limited to, the following:

1. Adjustment of sprinkler height and plumb to compensate for settlement and/or plant growth.
2. Backfilling of all trenches.
3. Adjustment of head coverage (arc of spray) as necessary.
4. Unstopping heads plugged by foreign material.
5. Drip System:

    a. Remove disc stack and rinse with water and replace every 6 months.
    b. Compare the controller runtimes and frequency to the to the application rate for Techline CV at the spacing used. If the amount of water in inches/hour is insufficient or exceeds the requirement of the plant, adjust accordingly.
    c. Refer to “Techline Design Manual” by Netafimusa.com.

6. Adjustment of controller as necessary to insure proper sequence and watering time.
7. All maintenance necessary to keep the system in good operating order. Repair of damage caused by vandals, other contractors or weather conditions shall be considered extra to these specifications.

C. Warranty and maintenance after final acceptance does not include alterations as necessitated by re-landscaping, re-grading, addition of trees or the addition, and/or changes in sidewalks, walls, driveways, etc.

D. Contractor must declare compliance with section 1903.251, Texas Occupations Code.

1.4 SUBMITTALS

A. The Contractor shall submit shop drawings or manufacturer's "cut sheet" for each type of sprinkler head, nozzle, pipe, controller, valves, check valve assemblies, valve boxes, wire, conduit, fittings, drip irrigation lines and components, and all other types of fixtures and equipment proposed to install on the job. The submittal shall include the manufacturer's name, model number, equipment capacity, and manufacturer's installation recommendation, if applicable, for each proposed item.

B. No partial submittal will be accepted and submittals shall be neatly bound into a brochure and logically organized. After the submittal has been approved, substitutions will not be allowed except by written consent of the Owner’s Representative.

C. Shop drawings shall include dimensions, elevations, construction, details, arrangements, and capacity of equipment, as well as manufacturer's installation recommendations.

1.5 "APPROVED EQUAL" SUBSTITUTIONS

A. Several items in this section and on the plans are specified by a manufacturer's brand name and catalog number, followed by the phrase "or approved equal". This is not intended to unduly restrict competitive procurements or bidding, but is done to assure a minimum standard of quality which is believed to be best for the item specified.

1.6 CODES/PERMITS

A. All work under this section shall comply with the provisions of these Specifications, as illustrated on the accompanying drawings, or as directed by the Owner’s Representative and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies and all authorities having jurisdiction over this Project.

B. Installation of equipment and materials shall be done in accordance with requirements of the National Electrical Code, Applicable City Plumbing Code, and standard plumbing procedures. The drawings and these Specifications are intended to comply with all the necessary rules and regulations; however, some discrepancies may occur, the Contractor shall immediately notify the Owner’s Representative in writing of the discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with the regulations shall be paid for as covered by these Contract Documents.

C. The Contractor shall give all necessary notices, obtain all permits, and pay all costs in connection with his work; file with all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver to the Owner's Representative.

D. The Contractor shall include in the work any labor, materials, services, apparatus, or drawings in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on the drawings and/or specified.

E. The installation of the irrigation system shall be made by an individual or firm duly qualified with a minimum of five years experience installing systems of similar size and scope, and licensed under Article No. 8751 VTCS, Titled "Licensed Irrigators Act", S.B. No. 259 as passed by the 66th Texas Legislature.

1.7 EXISTING UTILITIES

A. Locations and elevations of various utilities included with the scope of this work have been obtained from the most reliable sources available and should serve as a general guide without guarantee to accuracy. The Contractor shall examine the Site and verify to his own satisfaction the locations and elevation of all utilities and availability of utilities and services required. The Contractor shall inform himself as to their relation to the work and the submission of bids shall be deemed as evidence thereof. The Contractor shall repair at his own expense, and to the satisfaction of the Owner, for damage to any utility shown or not shown on the plans.

B. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify the Landscape Architect for instructions as to further action.

C. Contractor shall make necessary adjustments in the layout as may be required to connect to existing stub-outs, should such stub- outs not be located exactly as shown and as may be required to work around existing work, at no increase in cost to the Owner. All such work will be recorded on record drawings and turned over to the Owner prior to final acceptance.

1.8 RECORD DRAWINGS

A. Record dimensioned locations and depths for each of the following:

1. Point of connection to proposed backflow devise as shown on plan.
2. Sprinkler pressure line routing (provide dimensions for each 100 lineal feet (maximum) along each routing, and for each change in directions).
3. Gate valves.
4. Sprinkler control valves (buried only).
5. Control wire routing.
6. Drip irrigation assemblies.
7. Other related items as may be directed by the Owner's Representative.

B. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs, or pavements).

C. Record all changes which are made from the Contract drawings, including changes in the pressure and non-pressure lines.

D. Record all required information on a set of blackline prints of the Contract drawings. Do not use these prints for any other purpose.

E. Maintain information daily. Keep Contract drawings at the Worksite at all times and available for review by the Owner's Representative.

1.10 CONTROLLER CHART

A. Do not prepare chart until record drawings have been approved by the Owner's Representative.

B. Provide one controller chart for the stations used on the automatic controller(s).

1. Chart may be a reproduction of the record drawing, if the scale permits fitting within the controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.
2. Chart shall be blackline print of the actual system, showing the area covered by that controller.

C. Identify the area of coverage of each remote control valve, using a distinctly different pastel color, drawn over the entire area of coverage.

D. Following approval of chart by the Owner's Representative, it shall be hermetically sealed between two layers of 20 mil. thick plastic sheet.

E. Chart must be completed and approved prior to final acceptance of the irrigation system.

1.11 OPERATING AND MAINTENANCE MANUALS

A. Provide individual bound manuals detailing operating and maintenance requirements for irrigation systems.

B. Manuals shall be delivered to the Owner's representative for review and approval no later than 10 days prior to completion of work. Revise manual as required.

C. Provide descriptions of all installed materials and systems in sufficient detail to permit maintenance personnel to understand, operate, and maintain the equipment.

D. Provide the following in each manual:

1. Index sheet, stating Irrigation Contractor's name, address, telephone number, and name of person to contact.
2. Duration of guarantee period.
3. Equipment list providing the following for each item:

a. Manufacturer's name.
b. Make and model number.
c. Name and address of local manufacturer's representative.
d. Spare parts list in detail.
e. Detailed operating and maintenance instructions of major equipment.

4. Recommended programs for watering by season.

1.12 CHECKLIST

A. Provide a signed and dated checklist, and deliver to the Owner's Representative prior to final acceptance of the work.

B. Use the following format:

1. Plumbing permits: if none required, so note.
2. Material approvals: approved by and date.
3. Pressure line tests: by whom and date.
4. Record Drawings: received by and date.
5. Controller charts: received by and date.
6. Materials furnished: received by and date.
7. Operation and maintenance manuals: received by and date.
8. System and equipment operation instructions: received by and date.
9. Manufacturer's warranties if required: received by and date.
10. Written guarantee: received by and date.
11. Lowering of heads in lawn areas: if incomplete, so state.

1.13 ELECTRIC POWER

A. Electric power to operate the controller shall be furnished by the Electrical Contractor unless otherwise noted on the plans. Service wiring to the controller cabinet shall be furnished by the Irrigation Contractor.

1.14 WATER FOR TESTING

A. Unless noted otherwise on the plans or elsewhere, water is available on the site necessary for testing, flushing, and jetting.

1.15 BORINGS, SLEEVES AND ELECTRICAL CONDUITS

A. Sleeves and electrical conduits are the responsibility of the Irrigation Contractor to install prior to paving or related construction and should be installed as noted on the approved irrigation plan. Contractors shall be responsible for locating all sleeves and conduits at no additional cost to the Authority. Borings under existing paving will be required where noted on the drawings and shall be provided at no additional cost to the Owner. Borings shall be a minimum of 18 inch depth and new pipes shall be incased in Schedule 40 PCV sleeves.

1.16 ATTIC STOCK - SPARE PARTS

A. The Contractor shall supply the Owner with five parts each of irrigation system components excluding controller, mainline pipe and lateral pipe. These items will be kept for use by the Owner after the Landscape Maintenance for One (1) Year period is **completed.**

1.17 COMMISSIONING

A. This Section specifies a system which will be commissioned as part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Commissioning Coordinator.

B. Commissioning requires the participation of this Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. This Contractor shall be familiar with all parts of the Commissioning Section and the commissioning plan issued by the Commissioning Coordinator and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.18 POINT OF CONNECTION

A. Verify main, meter location, and water pressure at the site, if minimum residual water pressure is less than required, notify owner's representative prior to construction. Contractor shall notify the owner's representative of such and shall receive owners' approval prior to any construction.

B. Follow all state and local codes.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless otherwise noted on the plans, all materials shall be new and unused. The irrigation equipment catalog numbers used for reference in these Specifications are to establish minimum quality standards and may be substituted with an "approved equal" as outlined in Paragraph 1.06 of this section, unless specifically requested by the campus maintenance staff and noted as having no "approved equal" to be accepted.

2.2 POLYVINYL CHLORIDE PIPE (PVC PIPE)

A. PVC pipe manufactured in accordance with ASTM Standards noted herein.

B. Marking and Identification: PVC pipe shall be continuously and permanently marked with following information: Manufacturer's name, size, type of pipe, and material, PVC number, Product Standard number, and the NSF (National Sanitation Foundation) Seal.

C. PVC pipe fittings: Shall be of the same material as the PVC pipe specified and compatible with PVC pipe furnished. Solvent weld type shall be for Schedule 40.

D. PVC Pipe: Lateral line pipe shall be Class 200 solvent weld, SDR-21, PS 22-70 for all sizes 1" - 3". Mainline pipe shall be Class 200.

E. Flexible PVC Risers (Nipples): All flexible PVC nipples shall be made from virgin PVC material, and shall comply with ASTM D2287, shall be tested at 200 P.S.I. static pressure for 2 hours and have a quick burst rating of a minimum 400 P.S.I. Flexible PVC pipe nipples shall be factory assembled only.

2.3 SWING JOINTS

A. Swing joints shall be O-ring seal type. Use Lasco or approved equal.

2.4 WIRE AND SPLICES

A. All wire shall be single strand solid copper, minimum 14 gauge with type UF insulation which is Underwriters Laboratory approved for direct underground burial when used in a National Electrical Code Class II Circuit (30 volts AC or less) as per Articles 725 and 300. Voltage drop shall be taken into consideration.

B. All wire shall be color coded so that the common wire shall have white insulation and the signal wires shall have red insulation.

C. All splices shall be made with King one step Dry splices Tan or Larger.

D. All connectors shall be UL listed, rated 600 volt, for PVC insulated wire. No wire splices shall be buried.

2.5 MANUAL VALVES

A. Manual valves 2 ½" and smaller shall be all brass, globe type with composition disc rated at 150 pounds W.O.G.

B. All valves shall have wheel handles unless cross handles are called for on the plan.

2.6 VALVE BOXES

A. A box shall be provided for all valves.

B. Valve boxes shall be made of high-strength plastic suitable for turf irrigation purposes.

C. Boxes shall be suitable in size and configuration for the operability and adjustment of the valve.

D. Extension sections will be used as appropriate to the depth of piping.

E. All valve box covers shall bolt down or have locking mechanisms and shall be colored green.

2.7 POP-UP SPRAY, MICRO SPRAY, ROTOR AND BUBBLER HEADS

A. Pop-up spray, rotor and bubbler heads are specified on the drawings.

B. Two bubbler head shall be provided per each tree per locations as shown on the plans.

C. Spray heads shall have a minimum 4" pop-up or 12” pop-up as designated on the drawings. The sprinkler body and all related parts shall be plastic cycolac or polycarbonate. They shall have a spring retraction for positive return action of the pop-up nozzle. The spring for retraction and the adjustable nozzle screw shall be made of corrosion resistant materials.

D. All heads are to be operated and site adjusted to match precipitation rate of all heads in the zone with proper nozzle selection and arc adjustments.

E. MICRO-SPRAYS -The nozzle shall be constructed of corrosion and UV-resistant plastic. The nozzle shall have a pop-up stem that when under water pressure, pops up an additional inch. It shall also have a stainless steel retraction spring to retract the stem when water pressure is released. The stem shall have an integral elastomeric flow bushing for maintaining a constant flow rate over the operating pressure range of 25 to 60 PSI (1.7 to 4.1 bars; 172 to 413 kPa). The nozzle shall be protected from debris by a stainless steel screen that is integral to the pop-up stem. The nozzle shall have standard female threads that are compatible with the threaded riser on Hunter spray heads as well as some other manufacturer’s spray heads. The nozzle shall carry a two-year, exchange warranty (not prorated). Must be installed in Institutional spray body.

2.8 DRIP IRRIGATION

A. The dripperline shall be Techline CV as manufactured by Netafim Irrigation, Inc. Dripper flow rate and spacing shall be as indicated on drawings.

B. Soil Staples (TLS6): All on-surface/under mulch Techline CV/Techline Techlite installations shall be held in place with Techline Soil Staples spaced evenly every 3’ to 5’ on center, and with two staples on each change of location.

C. Line Flushing Valves: All Techline/Techlite systems shall be installed with Netafim Automatic Line Flushing Valves as indicated on drawings. Techline CV zones do not require an automatic

line flushing valve but must have a manual flushing port(s) in the position that an automatic flush valve would be positioned.

D. Pressure Regulator: A pressure regulator shall be installed at each zone valve or on the main line to ensure operating pressures do not exceed system requirements. The pressure regulator shall be a Netafim Pressure Regulator.

E. Disc Filter: A disc filter shall be installed at each zone valve or on the main line to ensure proper filtration. The filter shall be a Netafim Disc Filter. Model number and mesh as indicated on drawings.

2.9 ELECTRIC CONTROLLER (PERMANENT IRRIGATION)

A. Electric irrigation controller shall be capable of operating the number of stations as indicated on the drawings. The system is designed to operate only one section valve at a time, unless otherwise noted. The controller will be specified on the irrigation plan.

B. Power source shall be standard 117=/- volt 60 Cycle AC. Output for operation of companion solenoid actuated valves shall be 24 volts 60 Cycle AC.

C. Operation of the controller shall be full automatic, incorporating one 24 hour clock and 14 day calendar per controlled number of electric valves shown on the plan to start the sprinkling cycle any hour or hours of the day or night of any day or days over a repeating 14 day period.

D. The controller shall be capable of repeating watering cycles as required with a maximum delay between the ending of one cycle and the beginning of the next not to exceed 2 hours. Control shall provide optional semi-automatic operation whereby the automatic cycle may be started independent of the clock and manual operation whereby any station may be operated by hand independent of all timing mechanism. The choice of automatic day or hour programming shall be available to the operator on the face of the control panel without the use of tools.

E. The automatic controller shall be equipped with rainproof housing.

F. Provide automatic rain/freeze shutoff with controller.

2.10 ELECTRIC REMOTE CONTROL GLOBE VALVES

A. Electric remote control valves shall have plastic bodies and covers and shall be globe-type diaphragm valves of normally closed design.

B. A flow stem adjustment shall be included in each valve.

2.11 BACKFLOW PREVENTER

A. A double-check assembly shall be located and sized as shown on the plans.

B. This assembly shall be installed in a box and shall conform to the City Plumbing Codes.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Design Pressure: This irrigation system has been designed to operate with a minimum static inlet water pressure as indicated on the drawing. The Contractor shall take a pressure reading prior to beginning construction. If the pressure reading is 5% less than indicated, the Contractor shall notify the Owner's Representative.

B. Contractor Responsibility: The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage, area dimensions or water pressure exist that might not have been considered in the engineering. Such obstructions or differences shall be brought to the attention of the Owner's Representative in writing. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

C. Staking: Before installation is started, place a stake or flag where each sprinkler is to be located, in accordance with drawing. Staking shall be approved by the Owner's Representative before proceeding.

D. Piping Layout: Piping layout is diagrammatic. Route piping around existing trees and root zones in such a manner as to avoid damage to plantings. Where access is restricted, bore under large existing trees to avoid damage and exposure of the root system. Do not dig within the ball of newly planted trees or shrubs.

E. In areas where trees are present, trenches will be adjusted on site to provide a minimum clearance of four times the trunk diameter of the tree (at its base) between any tree and any trench.

F. All material and equipment shall be delivered to the Worksite in unbroken reels, cartons or other packaging to demonstrate that such material is new and of a quality and grade in keeping with the intent of these Specifications.

G. Refer to plan details for drip installation.

H. Spray heads and Rotor heads cannot be located closer than 4" of any sidewalk, driveway or foundation.

3.2 EXCAVATION AND TRENCHING

A. The Contractor shall perform all excavation to the depth indicated in these Specifications and Contract drawings. The banks of trenches shall be kept as nearly vertical as practicable. Trenches shall be wide enough to allow a minimum of 4" between parallel pipelines or electrical wiring. Where rock excavation is required, or where stones are encountered in the bottom of

the trench that would create a concentrated pressure on the pipe, the rock or stones shall be removed to a depth of six (6) inches minimum below the trench depth indicated. The over depth rock excavation and all excess trench excavation shall be backfilled with loose, moist earth or sand, thoroughly tamped. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the trench bottom, such shall be removed to a depth and length required, and the trench backfilled to trench bottom grade as hereinafter specified, with course sand, fine gravel or other suitable material.

B. Bottom of trench grade shall be continued past ground surface deviations to avoid air pockets and low collection points in the line. The minimum cover specifications shall govern regardless of variations in ground surface profile and the occasional deeper excavation required at banks and other field conditions. Excavation shall be such that a uniform trench grade variation will occur in all cases where variations are necessary.

C. Trench excavation shall comprise the satisfactory removal and disposition of all materials, and shall include all shoring and sheeting required to protect the excavation and to safeguard employees.

D. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance back from edge of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted as directed by the Owner's Representative. When excavated material is of a rocky nature and the topsoil or any other layer of excavated material is suitable for pipe bedding and backfill in the vicinity of the pipe, such material shall be separately stockpiled for use in such bedding and pipe backfill operations, unless satisfactory imported material is used.

E. All excavations and backfill shall be unclassified and covered in the basic bid. No additional compensation will be allowed for rock encountered.

F. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations to their original conditions in a manner acceptable to the Owner's Representative.

3.3 PIPE INSTALLATION

A. Sprinkler Mains: Sprinkler mains are that portion of piping from water source to electric valves. This portion of piping is subject to surges since it is a closed portion of the sprinkler system. Sprinkler mains shall be installed in a trench with a minimum of 18 inches of cover.

B. Lateral Piping: Lateral piping is that portion of piping from electrical valve to sprinkler heads. This portion of piping is not subject to surges since it is an "open end" portion of the sprinkler system. Lateral piping shall be installed in a trench with a minimum of 12 inches of cover.

C. Remove lumber, rubbish, and rocks from trenches. Provide firm, uniform bearing for entire length of each pipeline to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Remove foreign matter or dirt from inside of pipe before welding, and keep piping clean during and after laying pipe.

D. PVC pipe shall not be installed where there is water in the trench, nor shall PVC pipe be laid when temperature is 40 deg. F or below or when rain is imminent. PVC pipe will expand and contract as the temperature changes. Therefore, pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction.

3.4 PVC PIPE AND FITTING ASSEMBLY

A. Solvent: Make solvent-welded joints following standards noted herein. Thoroughly clean pipe and fittings of dirt, dust, and moisture with an approved PVC primer before applying solvent.

B. PVC to Metal Connection: Work metal connections first. Use a non-hardening pipe dope such as Permatex No. 2 or "Teflon" tape on threaded PVC to metal joints. Use only light wrench pressure.

C. Threaded PVC Connections: Where required, use threaded PVC adapters into which pipe may be welded.

3.5 HYDROSTATIC TESTS

A Pressure Test: After the pipe is laid, the joints completed, and the trench partially backfilled, leaving the joints exposed for examination, the newly laid piping or any valved section of main pressure line piping shall, unless otherwise specified, be subjected for four hours to a hydrostatic pressure test of normal city water pressure. Each valve shall be opened and closed during the test. Enclosed pipe, joints, fittings, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade, as necessary. Cracked or defective pipe, joints, fittings, or valves discovered in consequence of this pressure test shall be repeated until the test results are satisfactory. All replacement and repair shall be at contractor's cost.

3.6 CONTROL WIRE INSTALLATION

A. All control wire less than 500 feet in length shall be continuous without splices or joints from the controller to the valves. Connections to the electric valves shall be made within 18 inches of the valve using connectors specified in Paragraph 2.4 of this section, unless otherwise approved by the Owner’s Representative in writing.

B. All control wires shall be installed at least 18 inches deep. Contractor shall obtain the Owner’s Representative's approval for wire routing when installed in a separate ditch. Control wires may be installed in a common ditch with piping; however, wires must be installed a minimum of 4 inches below or to one side of piping.

C. All wire passing under existing or future paving, sidewalk, construction, etc., shall be encased in PVC Schedule 40 conduit extending at least 2 feet beyond edges of paving, sidewalks, or construction.

3.7 POP-UP SPRAY, MICRO-SPRAY, ROTORY AND BUBBLER HEADS

A. Provide heads and nozzles as specified and install in locations as shown on the Contract Drawings.

B. Pop-up spray and micro-spray heads shall be installed on a poly riser pipe connector as detailed. Rotary heads shall be installed on a double swing joint connected to the lateral pipe. Bubbler shall be a po-up spray head on a poly riser. Keep heads a minimum of 4 inches from paved surfaces.

C. Heads shall be installed with underside of flange flush with the finished grade.

D. Contractor will be required to adjust heads as necessary after establishment of grass or other plant material.

3.8 QUICK COUPLING VALVES

A. Quick coupling valves shall be installed as indicated on the plans along mainline with a ball valve preceding the QC for shut off.

B. Quick coupling valves shall be installed with the underside of flange flush with the finished grade.

C. Quick coupling valves shall be installed on a swing joint assembly as detailed on the submitted and approved shop drawings.

D. Under the warranty, the Contractor shall return after grass is established and adjust valves and valve boxes to proper grade.

3.9 MANUAL VALVES

A. Manual valves shall be sized and located where shown on the Contract drawings.

B. Valve boxes shall be adjusted to be flush with finished grade.

C. Valve boxes shall be properly supported and of sufficient construction that tractors, mowers or other equipment crossing over the boxes will not push boxes down and crush the pipe, valve, or box.

3.10 VALVE AND VALVE BOX PLACEMENT

A. A ball valve shall precede each valve to provide shut off for repair of valves.

B. All manual, electric, and quick coupling valves shall be in boxes as specified in Paragraph 2.6 of this section, and shall be set with a minimum of six (6) inches of space between their top

surface and the bottom of the valve box. The base of the box shall be filled with pea gravel per manufacturer's installation instructions.

C. Valves shall be fully opened and fully closed to ensure that all parts are in operating condition.

D. Valve boxes shall be set plumb, vertical, and concentric with the valve stem.

E. Any valve box which has moved from this required position so as to prevent the use of the operating wheel of the valve shall be reset by the Contractor at his own expense.

3.11 ELECTRIC CONTROLLER

A. Electric controller shall be located as shown on the plans and shall be capable of operating the number of stations indicated.

B. The system is designed to operate only one section at a time, unless otherwise noted on the plans in strict accordance with the manufacturer's published installation instructions.

3.12 ELECTRIC REMOTE CONTROL VALVES

A. Remote control valves shall be located and sized as shown on the plans. All electrical connections shall be made when the weather is dry with connection kits as specified in Paragraph 2.4 of this section in strict accordance with manufacturer's recommended procedures. All remote control valves shall be installed in a horizontal position, in accordance to the manufacturer's published installation instructions.

B. It shall be the responsibility of the Contractor to furnish and install the proper size wire on each of the low voltage circuits from the master control center to the various electric remote control valves.

C. Consideration shall be given to each circuit for allowance of voltage drop and economy consistent with accepted practices of electrical installation. Under no circumstances shall the voltage of any branch circuit be reduced more than proper due to length of run exceeding the maximum allowable for the wire size used.

3.13 BACKFILL AND COMPACTION

A. After system is operating and required tests and inspections have been made, the trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, gravel, soft shale, or other approved materials, free from large clods of earth or stone. Rock, broken concrete, or pavement, and large boulders shall not be used as backfill material. The backfill shall be thoroughly compacted and evened with the adjacent soil level.

B. Compact trenches in areas to be planted by thoroughly flooding the backfill. Compact all other areas by flooding or hand tamping. The jetting process may be used in areas when flooding.

C. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to a minimum of 90% density.

D. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for compaction, then refilled and compacted with the surface restored to the required grade and left in a completed surface condition as described above.

E. Specifically tamp backfill under heads and around the flange of heads for one foot (1') by a suitable means after trench backfill has dried from flooding to prevent heads loosening in the ground.

3.14 FINAL ADJUSTMENT

A. After installation has been completed, make final adjustment of sprinkler system prior to Owner’s Representative's final inspection.

B. Completely flush system to remove debris from lines by removing nozzle from heads on ends of lines and turning on system.

C. Check sprinklers for proper operation and proper alignment for direction of throw.

D. Check each new section for operating pressure and balance to other sections by use of flow adjustment on top of each valve.

E. Check nozzling for proper coverage. Prevailing wind conditions may indicate that arc or angle of spray should be other than as shown on drawings. In this case, change nozzles to provide correct coverage and furnish record data to Owner’s Representative with each change.

F. After system is thoroughly flushed and ready for operation, each section of sprinklers shall be adjusted to control pressure at heads. Use the following method, one section at a time:

1. Remove last head on section and install a temporary riser above grade. Install tee with pressure gauge attached on top of riser and re-install head with nipple onto tee.
2. Correct operating pressure at last head of each section as follows: Spray Heads - 20-25 psi; rotor heads - 30 to 40 psi (and as recommended by the manufacturer).
3. After replacing head, at grade, tamp thoroughly around head.

3.15 CLEAN-UP

A. The Worksite shall be thoroughly cleaned of all waste materials and all unused or salvaged materials, equipment, tools, etc.

B. After completion of the work, areas disturbed shall be leveled and the Worksite shall be raked clean and left in an orderly condition.

PART 4 - METHOD OF MEASUREMENT

4.1 MEASUREMENT

A. Landscape Irrigation Systems described in this section will be paid for on a lump sum basis wherein no measurement will be made.

PART 5 - PAYMENT

5.1 PAYMENT

A. Landscape Irrigation Systems will be paid for at the Contract lump sum, which price will be full compensation for furnishing and installing equipment; shop drawings; providing all submittals and warranties; furnishing all labor, materials, tools, equipment; and incidentals necessary to complete the work as described in this section and related other sections of these Specifications and plans, as well as maintenance until final acceptance.

END OF SECTION 02810

32 93 00 – PLANTING

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

The requirements of the "General Conditions of the Contract" and General Requirements, shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.02 SCOPE OF WORK

Furnish all labor, material, equipment and services necessary to provide all landscape planting, complete in place, as shown and specified.

1.03 QUALITY ASSURANCE

A. Source Quality Control:

1. Submit documentation to Project landscape architect within fifteen (15) days after award of Contract that all plant material is available and has been purchased, contracted to be grown, or reserved. Contractor shall be responsible for all material listed on plant list. Any and all substitutions due to unavailability must be requested in writing prior to commencement of installation. All materials shall be subject to inspection by Project Landscape Architect at any time after confirmation of ordering.

2. Plants shall be subject to inspection and approval of Project landscape architect at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Plant materials approved by the Project Landscape Architect shall be tagged with non-removable tags supplied by contractor with the project name. Tags shall remain until approval and acceptance of plant material on site.

3. Inspection and tagging of plant material by the Project Landscape Architect is for design intent only and does not constitute the Project Landscape Architect's approval of the plant materials in regards to their health and vigor as specified in Section 2. The health and vigor of the plant material is the sole responsibility of the Contractor.

4. The Contractor shall submit samples and/or specifications of any item being used on site as listed in section 2 herein.

5. Applicable standards for plant material shall be:

   a. American Standard for Nursery Stock, latest edition.
   b. American Joint Committee on Horticultural Nomenclature, latest edition.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Deliver fertilizer and other packaged materials to site in original unopened containers bearing manufacturers guaranteed chemical analysis, name, trademark, and conformance to State Law.

2. The Contractor shall furnish Project Landscape Architect with copies of receipts for all amendments specified in this Section.
3. Deliver all plants with legible identification labels stating proper botanical names and sizes indicated on plant list.
4. Protect plant material during delivery to prevent damage to root ball, trunks or branches, or desiccation of leaves.

5. The Contractor shall notify the Project Landscape Architect seven (7) days in advance of delivery of all plant materials and shall submit an itemized list of the plants in each delivery.

6. Department of Agriculture certificate shall accompany all grass seed and each delivery of sod used for solid sod or plugging to certify genetic identity and shall be furnished to the Owner.

B. Storage:

1. Maintain and protect plant material, including solid sod, not to be planted within twenty-four (24) hours in a healthy, vigorous condition.

2. Store plant material, including solid sod, in shade and protect from weather. Contractor to provide all water and protection necessary to keep plant material from freezing or drying.

3. Tree delivery and installation shall be coordinated such that they are completed on the same day. Should planting be unavoidably delayed, Contractor shall protect rootballs with a covering material such as sand or mulch, keeping trees in an upright or inclined manner, or other manner acceptable to the Project Landscape Architect.

C. Handling:

1. The Contractor is cautioned to exercise care in handling, loading, unloading and storing of plant materials. Plant materials that have been damaged in any way will be discarded and if installed, shall be replaced with undamaged materials at the Contractor's expense.

2. Under no circumstances is plant material to be handled by stem or trunk. All trees are to be handled with flexible straps secured around rootball.

3. Contractor to protect tree trunks and tree limbs from damage during planting with carpet or burlap strips.

1.05 JOB CONDITIONS

A. Work continuously on the site with exception of bad weather delays until the project is completed and as called for in the General Conditions.

B. Schedule: Install trees, shrubs, and liner stock plant material before lawn installation has commenced. Contractor to coordinate work with all other trades as stated in General Conditions.

1.06 GUARANTEE AND REPLACEMENT

A. All plant material installed under the Contract shall be guaranteed to remain alive and in

healthy, vigorous condition for a period of one year after date of written Final Acceptance of project landscape installation.

B. Replace all plant materials that are dead, dying, unhealthy or unsightly as determined by the Project Landscape Architect. Replacements shall be in accordance with the drawings and specifications and shall be guaranteed as set forth in Section A above. The cost of replacements is at the Contractor's expense. Material is to be replaced within fifteen (15) days of written notice by Owner or Project Landscape Architect.

C. Warranty shall not include damage or loss of plants due to acts of God, theft, fire, acts of vandalism, or negligence on the part of the Owner, as determined by the Project Landscape Architect.

D. Contractor shall remove all staking, guying and wrapping materials at the end of the guarantee period.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis. Contractor shall supply Project Landscape Architect with a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance or bearing the manufacturer's guaranteed analysis. Contractor shall submit a list and manufacturer's product information, including MSDS sheets, of all chemicals to be used on site to Owner for approval prior to any chemical application.

B. Organic Amendment to be composted mulch as manufactured by “Garden-Ville”, “Living Earth Technology", or approved equal. Submit sample and analysis for approval.

C. Soil Amendments:

1. Soil sulfur: Agricultural grade sulfur containing a minimum of 99% sulfur (expressed as elemental).
2. Iron sulfate: 20% Iron (expressed as metallic iron), derived from ferric and ferrous sulfate, 10% sulfur (expressed as elemental).
3. Gypsum: Agricultural grade product containing 98% minimum calcium sulfate.
4. Pre-Emergent Herbicide: Surflan or approved equal.

D. Fertilizer: EZ-Green slow release tablets, percentages by weight, (Nitrogen, Phosphoric acid, Potash), mixed by a commercial fertilizer supplier. Fertilizers for lawns shall be slow release fertilizers. Submit sample and analysis for approval.

E. Import Topsoil: Contractor to supply high quality imported topsoil of loamy character, high in humus and organic content from local agricultural source. Topsoil to be reasonably free from clay lumps, coarse sands, stones, roots, and other foreign matter. There shall be no toxic amounts of acid or alkaline elements. Red or Orange “sandy loam” will not be acceptable. Submit sample and analysis for approval.

F. Import Backfill for Berms: Contractor to supply high quality, select imported backfill from local approved source. Backfill to be reasonably free from clay lumps, coarse sands, stones, roots, and other foreign matter. There shall be no toxic amounts of acid or alkaline elements.

Submit samples to Project Landscape Architect for approval.

G. Plant Material: Plants shall be in accordance with the Texas State Department of Agriculture's regulation for nursery inspections, rules and rating. All plants shall have a normal habit of growth and shall be full, well branched, well-proportioned and symmetrical. Plants shall be sound, healthy, vigorous and free of insect infestations, plant diseases, sunscalds, and fresh abrasions of the bark, excessive abrasions, or other objectionable disfigurements. Tree trunks shall be sturdy and have well shaped branching systems and vigorous and fibrous root systems that are not root or pot-bound. The Project Landscape Architect reserves the right to examine the roots of any plant material he determines questionable. Samples to be chosen randomly and shall be at Contractor's expense.

1. Nursery Grown and Collected Stock: All material shall have been grown under climatic and soil conditions similar to those in locality of project. Container-grown stock shall be in vigorous, healthy condition, not root-bound or with root system hardened off, and shall have grown in container from seedling. Containerized stock shall be in vigorous, healthy condition, not root-bound or with root system hardened off, and shall have grown in container for a minimum of 8 months. Use only liner stock plant material that is well established in removable containers or formed homogeneous soil sections.

2. All ball and burlap trees shall have firm, natural root balls or sufficient size to encompass the fibrous and feeding root system necessary for full recovery and establishment of the plant. Cracked or soft or "mushroomed" rootballs will be unacceptable. Ball size shall conform to the latest edition of the American Standard for Nursery Stock. B&B materials shall be firmly wrapped with biodegradable burlap.

3. Specimen Stock: When detailed on the Plant List, specimen shall mean exceptionally fully developed, bushy, and heavily branched plants that have been grown individually in the nursery. They shall surpass the normal standard for nursery stock in their density and maturity, and shall form a symmetrical, tightly knit plant or picturesque characteristic if indicated.

H. Lawn Seed: All seed used shall be high quality, extra fancy, treated lawn type seed at the purity and germination specified, and shall be furnished in sealed standard containers with signed copies of a statement from the vendor certifying that each container of seed delivered is fully labeled in accordance with the Texas State Agricultural Code and is equal to or better than the requirements of these specifications. Lawn seed to be free of weed or noxious grass seeds. Submit sample and analysis for approval.

I. Native Grass Seeding for Erosion Control: Refer Specification 02932-N.

J. Non-Native Grass Seeding for Erosion Control: Refer Specification 02932-NN.

K. Native Grass and Wildflower Seeding for Erosion Control: Refer Specification 02932-NW.

L. Guying and Staking Materials: Reference plans for tree staking details that apply to portions of the project.

1. 8'-0" ht. Metal "T" stakes, dark green or black in color, approved by Project landscape architect. Contractor to install per detail on plans.

2. Wire & Cable: 10 gauge multi-strand galvanized wire or plastic chain ties will be used for all trees with a caliper of 1" to 3". 1/8" diameter aircraft cable with cable clamps will be installed with all tree calipers greater than 3".

3. Trunk Protection: ½" diameter rubber hose, length as needed to protect trunk and branches of tree when wire and cable are used. Black in color.

M. Tree Paint: Morrison Tree Seal, Cabort Tree Paint, or approved equal.

N. Water: Furnished by Owner on site through irrigation system at hose bib locations; all hoses, transportation across site and other necessary distribution to be provide by Contractor. If irrigation system is not functional or part of contract upon completion of planting, provide whatever means necessary to insure that all material is watered and maintained.

O. Mulch:

1. Tree and Pit Planted shrubs: Mulch shall consist of shredded cedar or hardwood bark mixture of varied lengths (1"-3") such that when installed will form a mat resistant to erosion. Mulch to be partially decomposed and shall be free of sticks, stones, clay or other foreign materials.

PART 3 - EXECUTION

3.01 INSPECTION

A. Obtain Owner's certifications that rough grades to plus or minus 0.10' have been established prior to commencing planting operations. Provide for inclusion of all amendments, settling, etc. Landscape Contractor shall be responsible for shaping and fine grading all planting areas as indicated on plans or as directed by Project Landscape Architect.

B. Verify location of all utilities prior to pit excavation and grading. Contractor is responsible for any damage to utilities and Owner's property. Coordinate with all other site contractors.

C. Inspect trees, shrubs and liner stock plant material for injury, insect infestation and trees and shrubs for improper pruning. Do not begin planting of trees until deficiencies are corrected or plants replaced.

D. Quantities shown on the plans are for the convenience of the Contractor. In case of discrepancy between the plant list and the plans, the plans shall govern. The Contractor is also responsible for determining the quantities needed to complete the installation to the full extent dimensioned on the drawings.

D. An automatic underground irrigation system may be part of the Contract. Contractor may coordinate the work to allow for the use of the system to irrigate the work in progress. Failure to adequately coordinate the work shall not relieve the Contractor of the need to provide water to landscape material up until Final Acceptance of the work.

3.02 PREPARATION

A. Soil Preparation:

1. Grades: Contractor to receive site at approximately finish grade unless otherwise noted on plan. Minor modifications to grade may be required by Contractor to establish final grade. Contractor will be responsible for removal of minor rocks and debris.

2. Soil Testing: The Owner and Project Landscape Architect reserve the right to require soil testing and results listing pH, fertility levels and percentages of sand, silt, and clay.

From this, the contractor may be required to submit to the Owner and Project Landscape Architect recommendations for soil amendments and fertilizers if different than those listed below. For bid purposes, use the soil amendment procedures listed.

B. Excavation:

1 Continuous planting beds, depth of excavation:
4 - 8 inches minimum below finish grade
One-gallon shrubs - 12 inches minimum below finish grade
Five-gallon shrubs –16 inches minimum below finish grade

2. Tree and shrub pit dimensions:
depth: 1-1/2 times the root ball (vertical sides)
width: 1 foot wider than the diameter of the rootball

3. All excess soil excavated from beds to be disposed of in a lawful manner off site unless by written consent, the Project Landscape Architect directs the Contractor to supplement lawn area with approved excavated soil or provides a spoil disposal area on site.

4. Contractor shall fracture and break rock or clay if encountered in excavation and perform a drainage test. The tree, shrub, or planting pits shall be filled with water and shall drain completely within a 24-hour period to be acceptable for planting. Notify Project Landscape Architect upon such occurrences.

5. Contractor to scarify bottom and sides of pit to ensure that glazing of clay pit does not occur. Contractor to be responsible to provide adequate drainage through shrub beds to prevent water logging of plants. Notify Project Landscape Architect if inadequate drainage in shrub beds occurs.

C. Backfill Mix for planting is to be provided; the standard plant bed mix as manufactured by “Living Earth Technology", “Gardenville” or approved equal.

1. Contractor to provide 48 hours’ notice to Project Landscape Architect prior to mixing of any soil on site for approval of amendments and mixed soil.
2. If soils are mixed off site, contractor shall submit location of pre-mix and mix analysis for Project Landscape Architect.

D. Pre-Plant Weed Control:

1. Spray weeds with a nonselective systemic contact herbicide, as recommended and applied by an approved licensed applicator.

2. Clear and remove these existing weeds upon herbicide's completed action by grubbing off all plant parts at least 1/2" below the surface of the soil.

3.03 PLANT INSTALLATION

A. Coordination:

1. If part of contract, Contractor to coordinate with Irrigation Contractor to insure functional irrigation system prior to any tree, shrub and groundcover installation.

B. Layout of Major Plantings: Tree locations and outlines of planting beds shall be marked on the ground by the Contractor before any plant pits are dug. The Project Landscape Architect

shall approve all such locations. If underground construction or utility line is encountered in the excavation of planting areas, other location for planting may be selected by the Project Landscape Architect.

C. Planting of Trees and Shrubs:

1. Protect all areas from excessive compaction when trucking plants or other material to the planting site. Protect existing site amenities during landscape operations.

2. Removal of containers:
   a. Remove bottom of plant boxes before planting. Remove sides of box without damage to root ball after positioning plant and partially backfilling.
   b. Remove top 1/3 of burlap from balled and burlap materials after setting plant.
   c. Remove all plastic fabrics, containers, ropes and wires from shrub and tree canopies and root balls.

3. All plants shall be set upright and plumb in center of hole. Plants or trees in formal plantings shall be laid out according to dimensions on plans. Plants shall be set to give best appearance. All plants shall be set slightly above (no more than 2”), or level with finished grade upon completion of planting operations. Adjust tree and shrub elevations should settlement occur.

4. Backfill pits immediately upon setting until hole or trench is one-half full. Hole should then be filled with water and tamped sufficiently to remove any air pockets.

5. Plant Tablets:

   a. After the water has completely drained, planting tablets shall be placed as indicated below:

      Three tablets per 15-gallon container
      Four tablets per 24" box or 2" tree
      Five tablets per 30" box or 3" tree
      Six tablets per 36" box or 4" tree
      Seven tablets per 42" box or 5" tree
      Eight tablets per 48" box or 6" tree

   Planting tablets shall be set with each plant on the top of the root ball while the plants are still in their containers so the required number of tablets to be used in each hole can be easily verified by the Project Landscape Architect.

6. Complete backfilling operations. Construct a 4" ht. water retention basin around plant pit with topsoil. Apply pre-emergent herbicide. Spread minimum 3" deep specified mulch within tree basins and all pit planted shrubs. Spread minimum 3” deep specified mulch within all planting beds.

7. Pruning: Trees shall be pruned and thinned out if there are too many internal branches. The trees should be open to allow more sunlight into the entire tree and too shape the tree. Weak crouches are to be removed. Remove dead or injured twigs and branches. Pruning may not be done prior to delivery of plants. Cuts over 3/4" in diameter shall be painted with specified tree paint. Trees that do not have a central leader will be rejected.

8. Staking: Staking of all trees shall be completed immediately after planting. All stakes shall be installed plumb and as indicated in details.

9. Planting of Shrubs (mass), ground covers and annuals:

    a. After excavation and scarification of planting bed, Contractor to fill bed with 4" specified backfill mix and apply Agricultural Gypsum at the rate of 50 lbs./1000 S.F. complete backfilling with specified mix to finished grade. Edging, if specified, shall be installed at this time.

    b. Plants shall be installed in straight rows and evenly spaced to fill bed, unless otherwise noted, and at intervals called out in the drawings. Triangular spacing shall be used unless otherwise noted on the drawings.

    c. After installation of all shrubs, groundcover and annuals, plantings shall be watered thoroughly. Any settling of plants or finished grade that occurs shall be repaired prior to installation of mulch. Finished grade of planting beds to be 1/2" below finished grade of adjacent pavement or curb.

    d. After water has drained from planting, but not more than 24 hours later, Contractor to apply pre-emergent weed control according to manufacturer's specifications.

    e. Following pre-emergent weed control applications, Contractor to install specified mulch to full 3" depth over entire bed area.

3.04 LAWN APPLICATION

A. Coordination:

1. Install hydromulch, plug or sod after tree, shrub and groundcover installation is complete.

2. If part of contract, Contractor to coordinate with Irrigation Contractor to insure functional irrigation system prior to any lawn installation.

B. Preparation:

1. Pre-Plant Weed Control:
    a. If weeds exist within proposed landscape areas at the beginning of work, spray with a nonselective systemic contact herbicide, as recommended and applied by an approved licensed applicator.

    b. Clear and remove these existing weeds upon herbicide's completed action by grubbing off all plant parts at least 1/2"-1" below the surface of the soil.

2. Contractor to scarify ground surface to a minimum 2" depth remove all sticks, trash, rocks and other debris and dispose off site prior to seeding/sodding. When solid rock is exposed or encountered within the first 2” depth of existing soil, place a minimum of 4” imported topsoil. All proposed berms shall have a minimum of 4” imported topsoil.

3. Contractor to rake entire area, leveling any imperfections in the grades left by site work contractor. Landscape contractor to ensure that there will be positive drainage and no ponding on site. Finished grade of lawn areas to be 1/2" below top of curbs, sidewalks and other pavements. Remove any large (greater than 1") dirt clods, rocks, and trash and prepare a smooth, level, loose and coarse surface. Project Landscape Architect to approve fine grading prior to any lawn installation. Lawn bed shall be moist (but not muddy) to receive seed, sod and plugs.

C. Hydromulch Application (when applicable):

1. Lawn areas to be seeded immediately after preparation of the bed. Do not use pre-emergent herbicide in areas to be seeded. Apply a uniform coat of hydromulch at the rates specified in Specification Item 604S – Seeding for Erosion Control and Item 604W – Seeding for Wildflowers.

2. Seed areas within seeding limits indicated on the plan and areas disturbed by construction operations.

3. Protect existing utilities (including irrigation system), plantings, paving and other site amenities from damage caused by hydromulching operations.

4. Immediately following application of hydromulch, the Contractor shall wash excess hydromulching material from previously planted materials, architectural features, etc. Care shall be exercised to avoid washing or eroding mulch materials from lawn area.

D. Sod Installation (if required):

1. Incorporate specified starter fertilizer at 2 pounds Nitrogen per 1000 square feet of lawn area for sodded areas.

2. Apply specified pre-emergent herbicide to fine graded areas prior to installation of solid sod. Do not use any Pre-emergent in areas to be overseeded with Rye Grass within three months. Use care to avoid wind drift or runoff to adjacent ornamental tree or shrub plantings.

3. Lay sod within 24 hours from time of harvesting.

4. Lay sod to form solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work sifted soil into minor cracks between pieces of sod; remove excess sod to avoid smothering adjacent grass.

5. Sod pads shall be of fullest size possible-no sod slivers or scraps will be permitted.

6. Finished grade of new sod shall be flush with adjacent lawn and pavement. Ensure positive drainage off all adjacent walkways and pavement.

7. Roll entire sodded area with sod roller. Water sod thoroughly.

3.05 CLEAN-UP

A. After all planting operations have been completed; remove all trash, excess soil, empty plant containers and rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. Contractor shall pick up all trash resulting from this work no less frequently than each Friday before leaving the site, once a week, and/or the last working day of each week. All trash shall be removed completely from the site.

B. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition. All walks shall be left in a clean and safe condition.

3.06 MAINTENANCE

A. General:

1. Maintain plant materials and lawn areas until final acceptance of the project.

2. Correct defective work as soon as apparent or as directed by Project Landscape Architect.

3. All debris (including clippings, leaves, etc.) shall be removed from project site.

4. Coordinate with irrigation contractor to ensure functional irrigation system. Notify Project landscape architect should any conflicts arise. Hand water all areas that do not have automatic irrigation system until fully established.

B. Trees, Shrubs, Groundcover and Annuals:

1. Maintenance shall include litter removal, watering, pruning, fertilizing, weeding and the application of appropriate herbicides, insecticides, and fungicides as necessary. Under no conditions shall shrubs be sheared (unless Contractor obtains written consent of Owner).

2. Corrective measures - tighten and repair guying and staking work, reset settled plants, remulch in order to maintain specified depths of mulch.

C. Lawn Areas:

1. Maintain lawn areas, including watering, fertilizing, rolling, weeding, and application of appropriate insecticides, herbicides and fungicides, and reseeding, plugging or sodding per plan until a full uniform stand of specified grass is achieved.

2. Repair, re-grade and reseed/replug/resod washed out or bare areas as required per original plan.

3.07 ACCEPTANCE

A. The landscape will be reviewed provided all work is in compliance with specifications and drawings and all plants and lawns are in healthy vigorous condition. Inspection to determine substantial completion of planted areas and lawns will be made by Project Landscape Architect upon Contractors request.

B. Substantial Completion will be granted when all plant material has been installed, hydromulching and sodding has been completed, and clean up on site has occurred.

C. Final Acceptance will be granted when:

1. All trees planted on site that are deemed unacceptable have been replaced and a fresh layer of mulch has been installed in all mulch beds.

2. All shrubs and groundcovers planted on site that are deemed unacceptable have been replaced and a fresh layer of mulch has been installed in all bed areas disturbed by replacements.

3. Seeded or plugged lawns shall be considered acceptable when established grass has grown

at least 1-1/2 inches high with cover exceeding 95% of lawn area and no bare spots greater than two (2) square feet exist. Lawn areas not meeting these criteria shall be repaired with original materials/methods specified on plans. Provide re-grading as necessary.

4. All items listed on punch lists and field reports have been completed.

3.08 OBSERVATION SCHEDULE

1. Refer to Division 1- General Requirements for schedule of meetings, conferences, and inspection schedule.

3.09 EXPIRATION OF GUARANTEE PERIOD

The Contractor shall be responsible for notifying the Owner 30 days prior to the expiration of the guarantee period (see section 1.06, A). The Contractor shall coordinate a meeting at such time with the Owner to inspect all plant material for its health. All plant material deemed dead or unhealthy is to be replaced at the contractor's expense and shall be guaranteed for a time period equal to that of the original guarantee. Contractor shall remove and dispose of all staking, guying and wrapping materials at the end of the guarantee period.

END OF SECTION 02900

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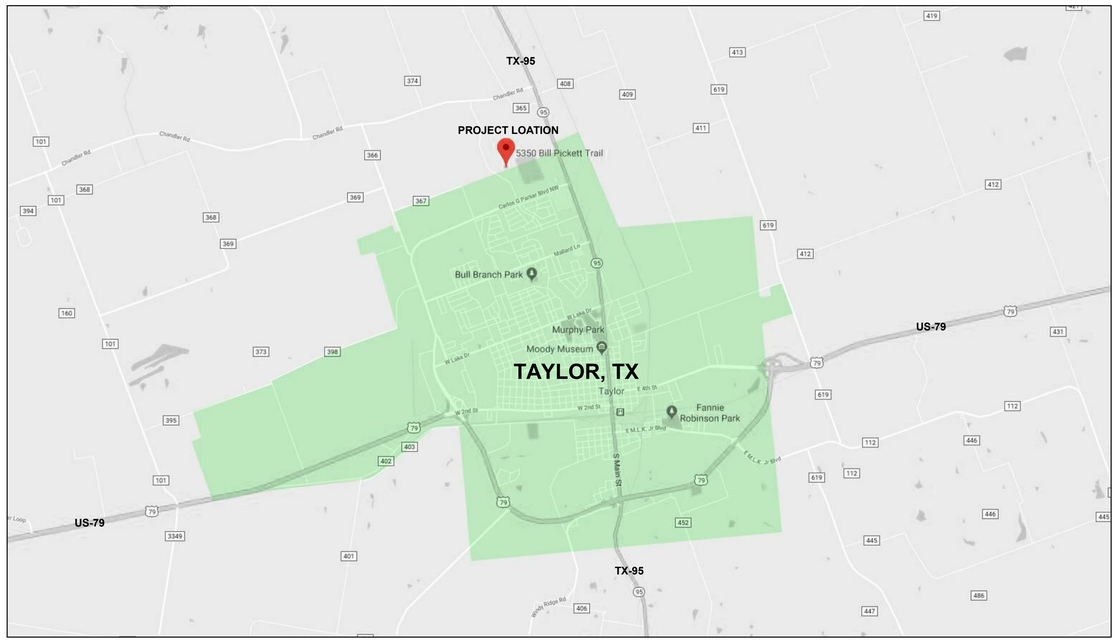
WILLIAMSON COUNTY EXPO - EAST CONCESSION & RESTROOMS

5350 BILL PICKETT TRAIL
TAYLOR, TEXAS 76574

CONSTRUCTION DOCUMENTS
1/11/2019

VICINITY MAP



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COVER SHEET
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DRAWING INDEX

GENERAL
X0-0 COVER SHEET
X0-1 DRAWING INDEX

LIFE SAFETY & CODE
LS0-01 CODE SUMMARY

DEMOLITION
D-1-1 DEMOLITION PLAN

CIVIL
C1-01 EAST CONCESSION & RESTROOM
C2-01 CONSTRUCTION DETAILS (1 OF 2)
C2-02 CONSTRUCTION DETAILS (2 OF 2)

STRUCTURAL
S000 STRUCTURAL NOTES
S100 FOUNDATION & ROOF FRAMING PLANS
S300 FOUNDATION DETAILS
S400 FRAMING DETAILS

ARCHITECTURAL
A0-01 GRAPHIC SYMBOLS/ PARTITION TYPES /ABBREVIATIONS
A0-02 TYPICAL TOILET LAYOUTS & ACCESSORIES

A1-1 SITE PLAN

A2-1 FLOOR PLANS
A2-2 ROOF PLAN & RCP

A5-1 EXTERIOR BUILDING ELEVATIONS

A7-1 BUILDING SECTIONS

A8-1 DETAILS
A8-2 SCHEDULE & DETAILS

MECHANICAL
M1-1 SCHEDULES, NOTES, AND LEGENDS - MECHANICAL
M1-2 DETAILS - MECHANICAL
M1-3 KITCHEN HOOD INFORMATION - MECHANICAL
M1-4 KITCHEN HOOD INFORMATION - MECHANICAL
M1-5 KITCHEN HOOD INFORMATION - MECHANICAL
M2-1 FLOOR PLAN - MECHANICAL

PLUMBING
P1-1 SCHEDULES, NOTES, AND LEGENDS - PLUMBING
P1-2 SCHEDULES - PLUMBING
P2-1 FLOOR PLAN - SUPPLY AND WASTE - PLUMBING

ELECTRICAL
E1-0 SITE PLAN - ELECTRICAL
E1-1 SCHEDULES - NOTES, AND LEGENDS - ELECTRICAL
E1-2 SCHEDULES AND RISER DIAGRAM - ELECTRICAL
E1-3 DETAILS - ELECTRICAL
E2-1 FLOOR PLAN - LIGHTING AND POWER
E4-1 ROOF PLAN - ELECTRICAL

AUDIO/ VISUAL
T000 TECHNOLOGY - INDEX SHEET
T010 TECHNOLOGY - SITE PLAN
T100 TECHNOLOGY - OVERALL FLOOR PLAN
T106 TECHNOLOGY- FLOOR PLAN - AREA F
T500 TECHNOLOGY DETAILS
T502 TECHNOLOGY DETAILS
T504 TECHNOLOGY DETAILS

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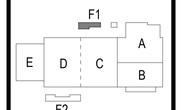
WILLIAMSON COUNTY EXPO
EAST CONCESSION & RESTROOM
5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019
SHEET TITLE: DRAWING INDEX

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
X0-1

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1/11/2019 4:10:11 PM

IBC 2009

CONSTRUCTION TYPE:	**IIB SPRINKLED**
OCCUPANCY TYPE:	**GROUP A4 - PRIMARY**
ALLOWABLE AREA:	**UNLIMITED**
EXISTING AREA:	**134,850 SF**
ALLOWABLE STORIES/HEIGHT:	**3/75'-0"**
EXISTING STORIES/HEIGHT	**1/39'-0"**
EAST CONCESSION HEIGHT:	**1/16'-2"**
EAST CONCESSION AREA:	**2,305 SF**

FIRE SPRINKLER EXEMPTIONS:

COVERED PENNING:	GROUP U OCCUPANCY
AREA F1 & F2:	UNDER 6,000 SQUARE FEET
EXISTING ARENA	

A
B
C

A - NUMBER OF OCCUPANTS USING EXIT
B - ACTUAL DOOR WIDTH (IN)
C - DOOR CAPACITY

FIRE EXTINGUISHER SYMBOLS

SMB FIRE EXTINGUISHER & SURFACE MOUNTED BRACKET

Exiting and restroom fixture numbers assumed based upon owners use of existing bleacher system within the Arena with a max occupancy of **3,000**.

Wheelchair spaces required: 23
Companion spaces required: 23

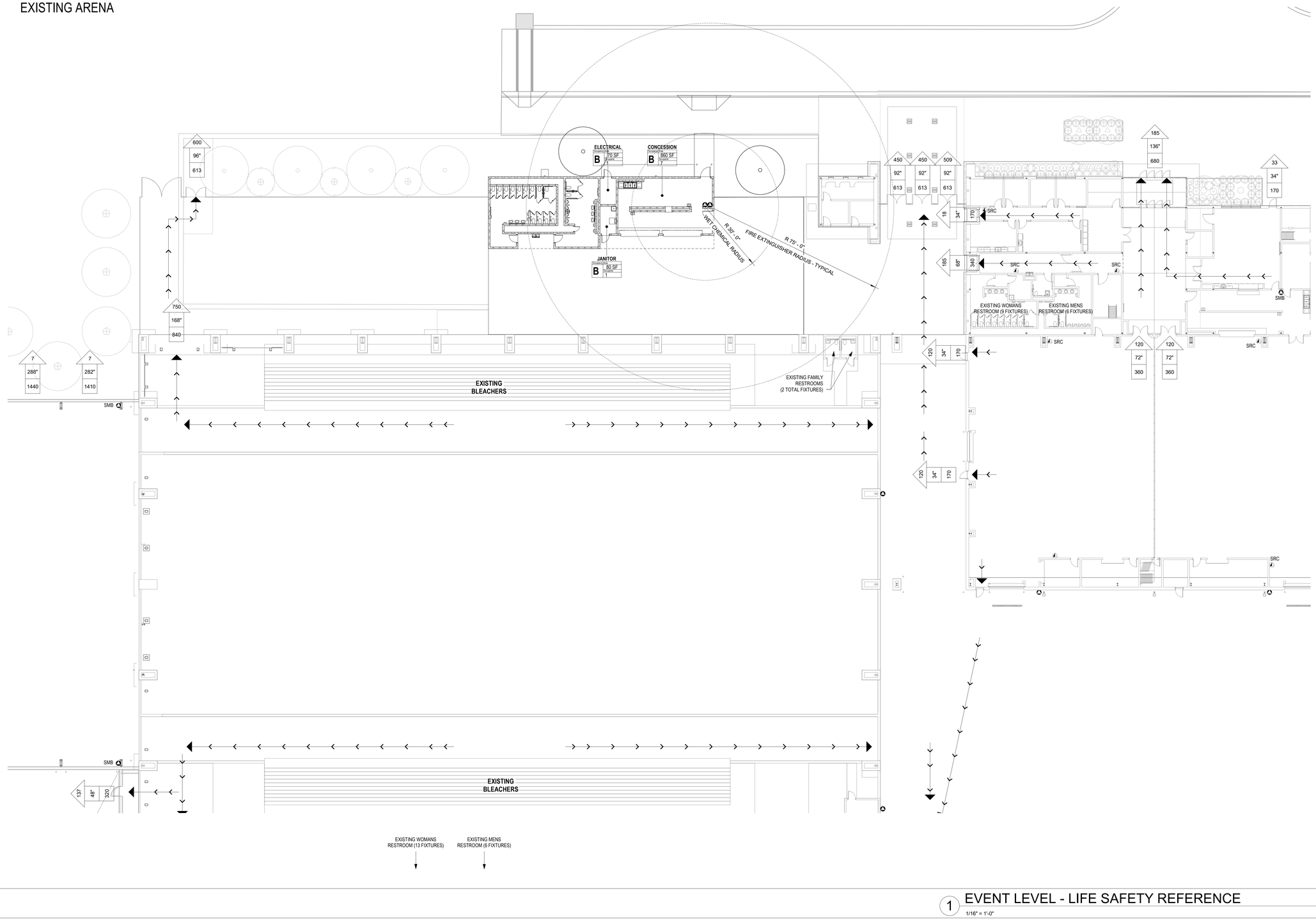
Restroom fixtures required/provided:

Men

Total Fixtures:	20/20* total (6 new)	
Lavatories:	8/11* total (3 new)	*Includes (2) existing family toilets

Women

Total Fixtures	38/38* total (13 new)	
Lavatories:	10/12* total (3 new)	*Includes (3) existing family toilets



1 EVENT LEVEL - LIFE SAFETY REFERENCE
1/16" = 1'-0"

PROJECT NORTH

NORTH

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EAST CONCESSION & RESTROOM

5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO. 14.3903
ISSUED BY POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
CODE SUMMARY

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

LS0-01

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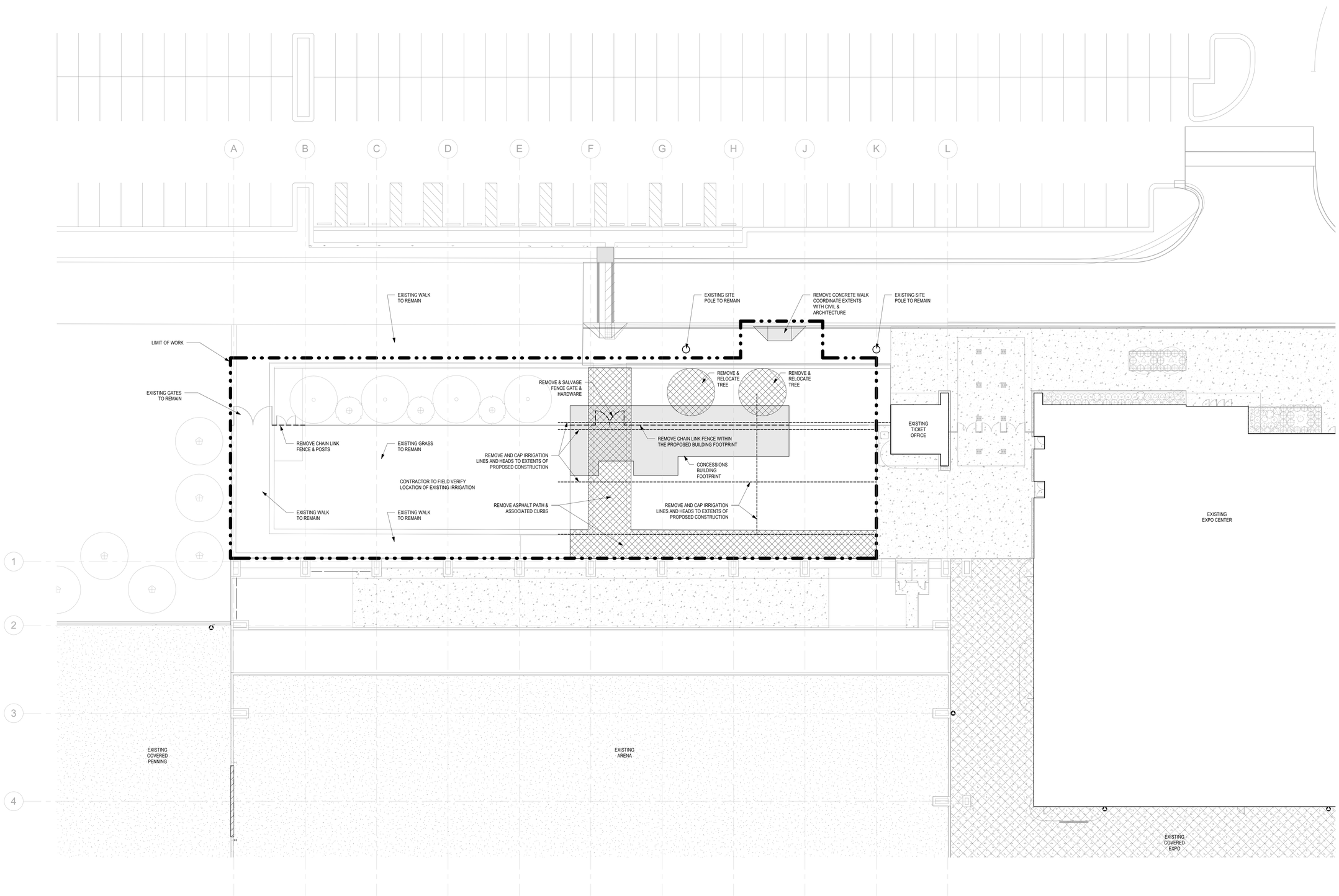

GENERAL DEMOLITION NOTES:

1. PROTECT EXISTING INFRASTRUCTURE.
2. ALL UTILITY COMPANIES NEED TO BE NOTIFIED PRIOR TO.
3. CONTRACTOR TO PROTECT EXISTING CONCRETE AND GRASSES SHOWN.
4. CONTRACTOR TO FIELD VERIFY AS-BUILT CONDITION, SIZE AND LOCATION OF IRRIGATION LINES AND HEADS. COORINATE WITH OWNER.

PROJECT NORTH

NORTH

1 DEMOLITION PLAN

1/16" = 1'-0"

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WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO. 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
DEMOLITION PLAN

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
D -1-1

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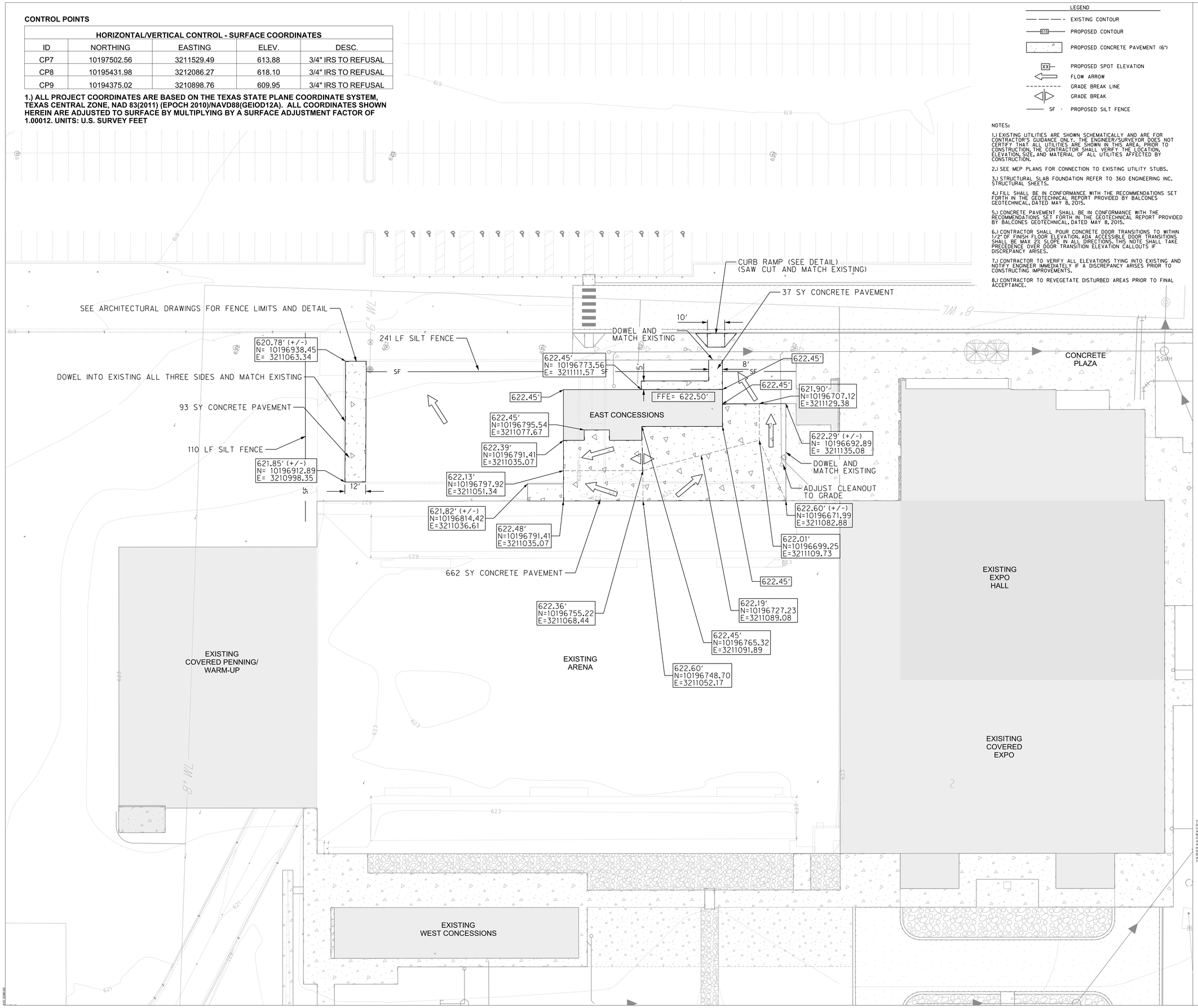
CONTROL POINTS

HORIZONTAL/VERTICAL CONTROL - SURFACE COORDINATES				
ID	NORTHING	EASTING	ELEV.	DESC.
CP7	10197502.56	3211529.49	613.88	3/4" IRS TO REFUSAL
CP8	10195431.98	3212086.27	618.10	3/4" IRS TO REFUSAL
CP9	10194375.02	3210898.76	609.95	3/4" IRS TO REFUSAL

1.) ALL PROJECT COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE, NAD 83(2011) (EPOCH 2010)/NAVD88(GEIOD12A). ALL COORDINATES SHOWN HEREIN ARE ADJUSTED TO SURFACE BY MULTIPLYING BY A SURFACE ADJUSTMENT FACTOR OF 1.00012. UNITS: U.S. SURVEY FEET



LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED CONCRETE PAVEMENT (6")
- XX PROPOSED SPOT ELEVATION
- FLOW ARROW
- GRADE BREAK LINE
- GRADE BREAK
- SF PROPOSED SILT FENCE

NOTES:

1.) EXISTING UTILITIES ARE SHOWN SCHEMATICALLY AND ARE FOR CONTRACTOR'S GUIDANCE ONLY. THE ENGINEER/SURVEYOR DOES NOT CERTIFY THAT ALL UTILITIES ARE SHOWN IN THIS AREA. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE LOCATION, ELEVATION, SIZE, AND MATERIAL OF ALL UTILITIES AFFECTED BY CONSTRUCTION.

2.) SEE MEP PLANS FOR CONNECTION TO EXISTING UTILITY STUBS.

3.) STRUCTURAL SLAB FOUNDATION REFER TO 360 ENGINEERING INC. STRUCTURAL SHEETS.

4.) FILL SHALL BE IN CONFORMANCE WITH THE RECOMMENDATIONS SET FORTH IN THE GEOTECHNICAL REPORT PROVIDED BY BALCONES GEOTECHNICAL, DATED MAY 8, 2015.

5.) CONCRETE PAVEMENT SHALL BE IN CONFORMANCE WITH THE RECOMMENDATIONS SET FORTH IN THE GEOTECHNICAL REPORT PROVIDED BY BALCONES GEOTECHNICAL, DATED MAY 8, 2015.

6.) CONTRACTOR SHALL POUR CONCRETE DOOR TRANSITIONS TO WITHIN 1/2" OF FINISH FLOOR ELEVATION. ADA ACCESSIBLE DOOR TRANSITIONS SHALL BE MAX 2% SLOPE IN ALL DIRECTIONS. THIS NOTE SHALL TAKE PRECEDENCE OVER DOOR TRANSITION ELEVATION CALLOUTS IF DISCREPANCY ARISES.

7.) CONTRACTOR TO VERIFY ALL ELEVATIONS TYING INTO EXISTING AND NOTIFY ENGINEER IMMEDIATELY IF A DISCREPANCY ARISES PRIOR TO CONSTRUCTING IMPROVEMENTS.

8.) CONTRACTOR TO REVEGETATE DISTURBED AREAS PRIOR TO FINAL ACCEPTANCE.

STATE OF TEXAS
NICHOLAS P. LESCHKE
103255
LICENSED
PROFESSIONAL ENGINEER

THE SEAL OPPOSITE APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY NICHOLAS P. LESCHKE, PE NO. 103255 ON 1/9/2019. ALTERATION OF A PREVIOUSLY SEALED DOCUMENT WITHOUT PROPER AUTHORITY AND THE ADDITION OF A FALSE SEAL IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT. THE RECORD COPY OF THIS DRAWING IS ON FILE AT THE OFFICES OF
HALFF ASSOCIATES, INC.
9500 AMBERGLEN BLVD.
BUILDING F, SUITE 125
AUSTIN, TEXAS 78729
TBPE FIRM #F-312

0 10 20 30 40
SCALE: 1"=20'

PROJECT NORTH

NORTH

POPULOUS

POPULOUS
Architecture, Planning, Interiors, Programming
300 Wyandotte, Suite 200
Kansas City, Missouri 64105
816/ 221-1500

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Round Rock, TX 78665
512-244-1966

MEP/Energy Consultants
Hendrix Consulting Engineers
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Round Rock, TX 78664
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PH (512) 777-4600
FAX (512) 869-0989

WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO. 14.3903
ISSUED BY: Halff Associates, Inc.
ISSUED DATE: 1/11/2019
SHEET TITLE: EAST CONCESSION & RESTROOM
DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
C1-01

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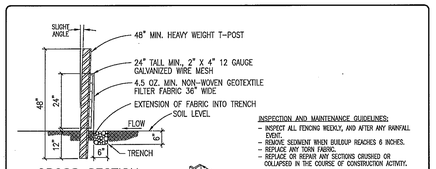
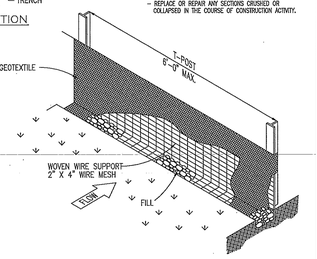
Bid 19/02-299
Williamson County, Texas



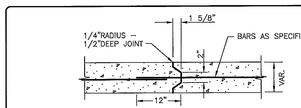
CROSS SECTION



INSPECTION AND MAINTENANCE GUIDELINES:
- INSPECT ALL FENCING WEEKLY, AND AFTER ANY RAINFALL EVENT.
- REMOVE SEDIMENT WHEN BUILDUP REACHES 6 INCHES.
- REPLACE ANY TORN FABRIC.
- REPLACE OR REPAIR ANY SECTIONS CRUSHED OR COLLAPSED IN THE COURSE OF CONSTRUCTION ACTIVITY.

INSTALLATION:
- LAYOUT THE SILT FENCE FOLLOWING AS CLOSELY AS POSSIBLE TO THE CONTOUR.
- CLEAR THE GROUND OF DEBRIS, ROCKS, PLANTS (INCLUDING GRASSES TALLER THAN 2") TO PROVIDE A SMOOTH FLOW APPROACH SURFACE. EXCAVATE 6" DEEP X 6" WIDE TRENCH ON UPSTROW SIDE OF FACE FOR PLANS.
- DRIVE THE HEAVY DUTY T-POST AT LEAST 12 INCHES INTO THE GROUND AND AT A SLIGHT ANGLE TOWARDS THE FLOW.
- ATTACH THE 2" X 4" 12 GAUGE WELDED WIRE MESH TO THE T-POST WITH 11 1/2 GAUGE GALVANIZED T-POST CLIPS. THE TOP OF THE WIRE TO BE 24" ABOVE GROUND LEVEL. THE WELDED WIRE MESH TO BE OVERLAPPED 6" AND TIED AT LEAST 6 TIMES WITH HOG RINGS.
- THE SILT FENCE TO BE INSTALLED WITH A 5KIRT A MINIMUM OF 11" WIDE PLACED ON THE UPHILL SIDE OF THE FENCE INSIDE EXCAVATED TRENCH. THE FABRIC TO OVERLAP THE TOP OF THE WIRE BY 1".
- ANCHOR THE SILT FENCE BY BACKFILLING WITH EXCAVATED DIRT AND ROCKS (NOT LARGER THAN 2").
- GEOTEXTILE SPLICES SHOULD BE A MINIMUM OF 18" WIDE ATTACHED IN AT LEAST 6 PLACES. SPLICES IN CONCENTRATED FLOW AREAS WILL NOT BE ACCEPTED.
- SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

APPROVED BY:	DATE:	CITY OF TAYLOR WILLIAMSON COUNTY, TEXAS STANDARD DETAILS	STANDARD
CS	JULY 2009	SILT FENCE DETAIL	EN 003

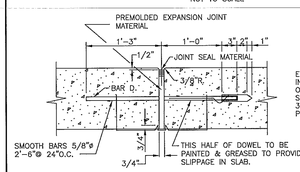


NOTE:
CONTRACTOR SHALL PROVIDE TRANSVERSE CONSTRUCTION JOINT SIMILAR IN DETAIL TO LONGITUDINAL CONSTRUCTION JT, OR EXPANSION JT. AT THE END OF EACH DAYS POUR OR WHEN DIRECTED BY ENGINEERS.

GENERAL NOTES:
1. CONCRETE OR BRICK CHAIRS APPROVED BY THE ENGINEER SHALL BE USED TO SUPPORT REINFORCING STEEL AND SHALL BE PLACED AT THE INTERSECTION OF LONGITUDINAL AND TRANSVERSE BARS AT SPACING AT 3'-8" LONGITUDINALLY AND 4'-0" TRANSVERSELY.
2. PAVEMENT LAYOUT WILL NECESSITATE THAT ALL CONSTRUCTION AND WARPING JOINTS COINCIDE WITH LANE LINES – THRU LANE CONSTRUCTION WILL BE CONTINUOUS WITH ALL LEFT TURN LANES AND TRANSITIONS TO BE POURED AS FILL-INS SUBJECT TO APPROVAL BY THE ENGINEER.
3. ALL TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS SHALL BE SPACED NOT TO EXCEED 20 FEET AND SHALL BE SAWED WITHIN 24 HOURS FOLLOWING CONCRETE PLACEMENT.

LONGITUDINAL CONSTRUCTION JOINT

NOT TO SCALE



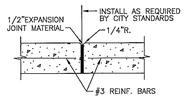
EXPANSION JOINTS TO BE AT INTERSECTIONS, BRIDGES, AND OTHER STRUCTURES AND AT SPACINGS NOT TO EXCEED 300 FEET. ALL JOINTS TO BE PROPERLY SEALED.

CONTINUOUS WELDED DOWEL BAR CHAIR CONSISTING OF 2 WIRE NO. 6 GAUGE WIRE CHAIR & DOWEL HOLDER AT EACH DOWEL & 2 3/8"ø STEEL BARS WELDED AT EACH INTERSECTION.

EXPANSION JOINT

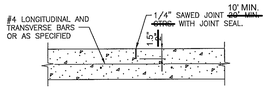
NOT TO SCALE

APPROVED BY:	DATE:	CITY OF TAYLOR WILLIAMSON COUNTY, TEXAS STANDARD DETAILS	STANDARD
CS	JULY 2009	JOINT DETAILS (1 OF 2)	PV 010



CURB & GUTTER EXPANSION JOINT DETAIL

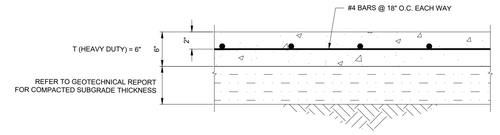
NOT TO SCALE



CONTRACTION JOINT DETAIL

NOT TO SCALE

APPROVED BY:	DATE:	CITY OF TAYLOR WILLIAMSON COUNTY, TEXAS STANDARD DETAILS	STANDARD
CS	JULY 2009	JOINT DETAILS (2 OF 2)	PV 011



NOTES:
1. BASED ON THE GEOTECHNICAL ENGINEERING REPORT PREPARED BY BALCONES GEOTECHNICAL (REPORT NO. 0115-001) DATED ON SEPTEMBER 9, 2015.
2. REFERENCE GEOTECHNICAL REPORT FOR EXACT PAVEMENT AND COMPACTION SECTION SPECIFICATIONS.

CONCRETE PAVING SECTION

N.T.S.

POPULOUS

POPULOUS
Architecture, Planning, Interiors, Programming
300 Wyandotte, Suite 200
Kansas City, Missouri 64105
816/ 221-1500

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MEP/Energy Consultants
Hendrix Consulting Engineers
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Woodway TX, 76712
254-548-3467

WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

PROJECT NO: 14.3903
ISSUED BY: HALFF ASSOCIATES, INC.
ISSUED DATE: 1/11/2019

SHEET TITLE:
CONSTRUCTION DETAILS (1 OF 2)

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

C2-01

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I:\2018\04-13\PWS\ARCH\Sheet Dir\PLOTS_13255.DWG
CONSTRUCTION DETAILS (1 OF 2).tx January 9, 2019, 8:20 AM, dh333

2/19/2019 12:38 PM

Bid 1902-299

Williamson County, Texas

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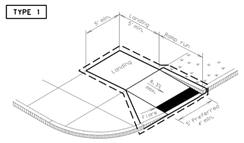
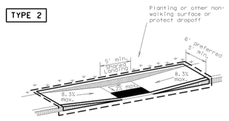
TYPE 1



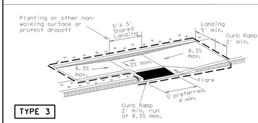
PERPENDICULAR CURB RAMP

TYPE 2



PARALLEL CURB RAMP
(Use only where water will not pond in the landing.)

TYPE 3



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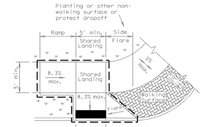

COMBINATION CURB RAMPS

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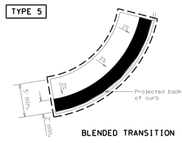
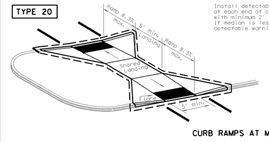


BLENDED TRANSITION

TYPE 20



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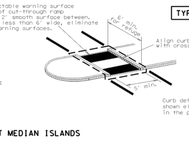
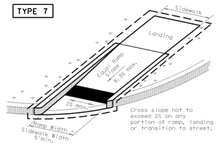


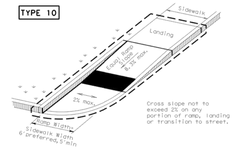
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7



(Sidewalk set back from curb)

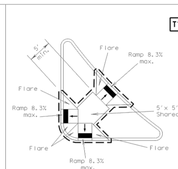
TYPE 10



(Sidewalk adjacent to curb)

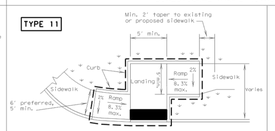
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 22



COMBINATION ISLAND RAMPS

TYPE 11



OFFSET PARALLEL CURB RAMP

NOTES / LEGEND:

See General Notes on sheet 2 of 4 for more information.

Denotes planting or non-walking surface not part of pedestrian circulation path.

Ramp Limits of Payment

Detectable Warning Surface

SHEET 1 OF 4

Texas Department of Transportation — Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
©TxDOT March 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
VP June 13, 2012	DIST	COUNTY		SHEET NO.

DATE:
FILE:

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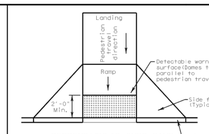
General Notes

Curb Ramps

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Lesser slopes that will still drain properly should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
4. Landings shall be 5' x 5' minimum with a maximum 2% slope in any direction.
5. Maneuvering space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
6. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC 68.102.
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Handrails are not required on curb ramps. Provide curb ramps wherever an accessible route crosses (penetrates) a curb.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Provide a smooth transition where the curb ramps connect to the street.
16. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
17. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.

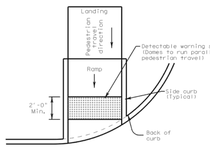
Detectable Warning Material

18. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with Section 705 of the TAS. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
19. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
20. Detectable warning surfaces must be slip resistant and not allow water to accumulate.
21. Detectable warning surfaces shall be a minimum of 24" in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
22. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb. Align the rows of domes to be perpendicular to the grade break between the ramp run and the street. Detectable warning surfaces may be curved along the corner radius.
23. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.



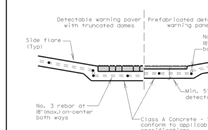
PERPENDICULAR CURB RAMP

Typical placement of detectable warning surface on sloping ramp run.

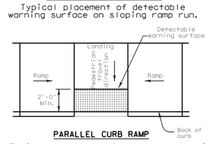


DIRECTIONAL CURB RAMP

Typical placement of detectable warning surface on sloping ramp run.



SECTION: CURB RAMP AT DETECTABLE WARNING



PARALLEL CURB RAMP

Typical placement of detectable warning surface on landing at street edge.

DETECTABLE WARNINGS

Detectable Warning Pavers

24. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
25. Lay full-size units first followed by closure units consisting of at least 25 percent of a full unit. Cut detectable warning paver units using a power saw.

Sidewalks

26. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within one or more reach ranges specified in TAS 308.
27. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
28. Street grades and cross slopes shall be as shown elsewhere in the plans.
29. Changes in level greater than 1/4 inch are not permitted.
30. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than 5% must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with TAS 505.
31. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
32. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
33. Sidewalk details are shown elsewhere in the plans.

SHEET 2 OF 4

Texas Department of Transportation — Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

PED-12A

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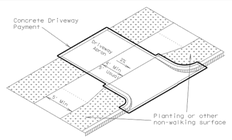
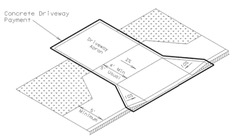
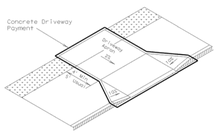


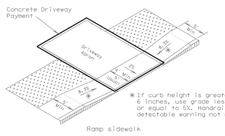
Setback sidewalk



Apron offset sidewalk



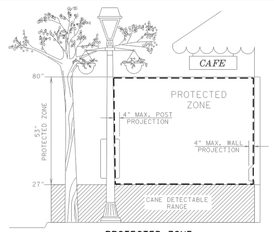
Wide sidewalk



Ramp sidewalk

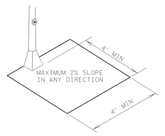
* If curb height is greater than 6 inches, use grade less than or equal to 5%. Handrail and detectable warning not required.

SIDEWALK TREATMENT AT DRIVEWAYS

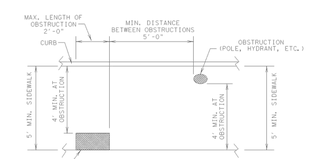


PROTECTED ZONE

In pedestrian circulation area, maximum 4" projection for post or wall mounted objects between 27"and 80" above the surface.



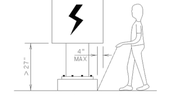
CLEAR GROUND SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



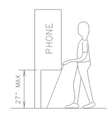
PLAN VIEW

PLACEMENT OF STREET FIXTURES

(ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' x 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.)



When an obstruction of a height greater than 27" from the surface would create a protrusion of more than 4" into the pedestrian circulation area, construct additional curb or foundation at the bottom to provide a maximum 4" overhang.



Protruding objects of a height ≤ 27" are detectable by cane and do not require additional treatment.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

SHEET 3 OF 4

Texas Department of Transportation — Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

PED-12A

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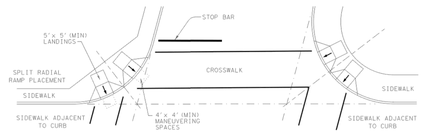
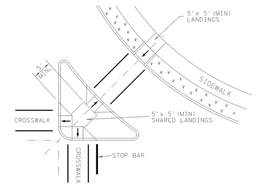
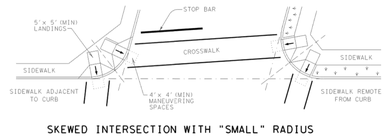


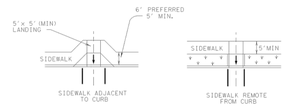
SKEWED INTERSECTION WITH "LARGE" RADIUS



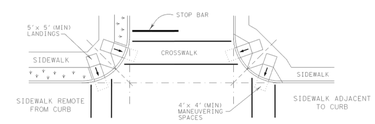
AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



SKEWED INTERSECTION WITH "SMALL" RADIUS



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS



NORMAL INTERSECTION WITH "SMALL" RADIUS

TYPICAL CROSSING LAYOUTS

SHEET 4 OF 4

Texas Department of Transportation — Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

PED-12A

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254-548-3467

WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

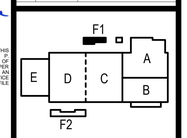
5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO: 14.3903
ISSUED BY: HALFF ASSOCIATES, INC.
ISSUED DATE: 1/11/2019

SHEET TITLE:
CONSTRUCTION DETAILS (2 OF 2)

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

C2-02

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I:\2016\04\12\385\400\CAD\Drawings\Civil\PED\C2-02 PED-12A.dgn 2/19/2019 12:38 PM
CONSTRUCTION DETAILS (2 OF 2), January 9, 2019, 8:21 AM, dh333

2/19/2019 2:38 PM

1/11/2019 9:50:49 AM

STRUCTURAL NOTES

I. DESIGN DATA

A. BUILDING CODE
INTERNATIONAL BUILDING CODE 2015 EDITION WITH CITY OF TAYLOR AMMENDMENTS.

B. DESIGN LOADS

1. Wind Load — Exposure C; Ultimate Wind Speed 90 MPH
2. Roof Loads — Live Load (L.L.) 20 PSF**; Dead Load (Design) (D.L) 20 PSF
3. Floor Loads

Live Load	100 PSF*
Dead Load (Superimposed)	5 PSF
Partitions	20PSF
Storage Mezzanines	100 PSF

4. Stairs, public corridors & Lobbies (L.L.) 100 PSF
5. Internal Pressure Coefficient 0.18 PSF
6. Seismic Zone — Design Cat. A; Site Class. C

*Reduced Per I.B.C. SEC. 1607.9
** Reduced Per I.B.C. SEC. 1605.3

The contractor shall verify all dimensions and shall coordinate all structural plans and details with the architect before starting work. The engineer shall be notified of any discrepancies prior to construction.

The structural systems of the floor and roof are designed to perform as a complete unit. During demolition and repair of these structures, structural components may be unstable and it is the responsibility of the contractor to provide temporary shoring and/or bracing as required for the stability of the incomplete structure and for the safety of all on-site personnel.

C. ALTERNATE DESIGNS

Alternate structural systems & details will only be considered, provided they are submitted with calculations certified by a Professional Engineer Registered in the State of the project. The calculations must show the equivalency of the alternate & acceptance of the alternate by the engineer must be in writing.

D. FUTURE EXPANSION

This project is designed for future expansion.

E. ROOF SLOPE

The roof has not been designed for ponding based on a roof slope of less than 3" per foot.
No parapets or secondary roof drains provided.

F. Contractor to verify all conditions at the jobsite and report any discrepancies to the engineer prior to start of any construction.

II. SPECIAL INSPECTIONS

A. Special inspections are required in accordance w/ Latest Edition IBC, Section 1701 for the following portions of construction:

1. Concrete
2. Bolts installed in concrete
3. Reinforced steel
4. Soils Compaction
5. Structural Bolting
6. Structural Welding
7. Deck installation

III. SITE WORK

A. SOIL REPORT

1. Foundations, retaining & basement walls, foundation drainage, slabs on grade & other items related to the soils are designed & shall be constructed in accordance with the recommendations of Balconies Geotechnical REPORT NO. 0115-001 DATED May 8, 2015.

2. Design net soil bearing capacity is as follows:
Grade beams- 3,000 PSF

BUILDING PAD PREPARATION (Slab-On-Grade Areas)

1. Remove all remaining vegetation, surficial clay soil, uncontrolled fill and obstructions from the existing surface of the site to a minimum of 5'-0" outside the building lines to a minimum of 5'-0" below finish grade or bottom of slab, whichever is deeper.
2. Scarify exposed subgrade a minimum of 12 inches deep. Recompact to 92% to 97% of maximum dry density at ±2% optimum moisture as determined by TEX-114E.
3. Construct a compacted base of select fill overlaying the existing soil with a minimum thickness of 60 inches below the bottom of the slab. The select fill shall be in compliance with the specifications in item 4 below.
4. Bring building areas to planned grade using off-site fill selected and compacted in accordance with the following:
   A. Gradation

Retained on 2-1/2" screen	0%
Retained on 7/8" screen	5%-50%
Retained on 3/8" screen	25%-65%
Retained on No. 4 mesh	35%-75%
Retained on No. 40 mesh sieve	60%-90%

   B. Plasticity Index
   Material passing the No. 40 sieve shall meet the following plasticity requirements:

Passing No. 40 Sieve	Maximum Plasticity Index	Minimum Plasticity Index
25%-40%	15	3
10%-25%	20	4

   C. No organic matter is permitted.
   D. Compaction
   Compact the material to at least 95% of the maximum dry density as determined TEX-113E Compact Test. Hold water contents during compaction to –2% to +2% of laboratory optimum and compacted lift thickness of 8 inches maximum.
   E. Approval
   All select fill material shall be approved by the Engineer prior to it being used on the project.

IV. FORMS

1. Materials:
   A. Lumber: All lumber and plywood used in the construction of forms for concrete shall be sound, clean and free of surface imperfections, and of sufficient size and thickness to rigidly support the loads involved.
   B. Plywood: Form plywood shall be sound and free of surface imperfections, and shall be manufactured with exterior glue suitable for use in forming concrete.
   C. Accessories: Form ties, clamps and other accessories shall be of such type, size, etc. as will safely support the loads to be encountered. Accessories on exposed faces shall be such as will not leave exposed metal on concrete face.
   D. Form Coating: Equal to Sonneborn Formsaver.

2. Application:
   A. The contractor shall employ an experienced surveyor to supply all necessary lines and levels to insure that all finished concrete work is properly located, straight, true and square.
   B. All vertical concrete surfaces shall be formed with wood, including edges of walks, slabs on grade, steps on grade and exposed portions of grade beams. If the earth will stand vertical and firm during excavating and concreting, no forms need to be constructed for concrete below grade.
   C. Form construction and removal shall conform to the recommendations and requirements of the appropriate sections of ACI Standard 347 and ACI Code 318, latest versions. All form work shall be placed straight, level, plumb and true to line, sufficiently supported, braced and tied to rigidly support the loads involved without movement, and constructed to maximize resistance to shortening of the member. All joints in form work shall be tight an neat to prevent leakage or irregularities in exposed surfaces.
   D. The contractor shall check with all other trades and make certain that all piping, conduit, sockets, inserts, sleeves, anchors, colts, etc., required by the various trades are properly placed and supported to prevent movement during concreting.
   E. The contractor shall obtain the Architect's and the Engineer's review and accept before placing any structural concrete, giving at least 48 hours notice before pours are scheduled. Obtain the Architect's approval before pouring non-structural concrete.
   F. The contractor shall construct form work to adequately support pressure from the wet concrete. Reinforcing shall be installed to the Engineer's satisfaction before placing concrete.
   G. Thoroughly clean all form surfaces in contact with concrete and coat with approved form coating. Oiled forms shall not be used for exposed concrete surfaces which are later to be plastered or rubbed.
   H. Leave all form work in place for a time consistent with recommendations of the American Concrete Institute. In general, the perimeter vertical beam forms may be removed within 24-28 hours after concrete is placed. Should inconsistencies and/or irregularities on the lines, levels or plumb of the concrete occur, the contractor shall make such corrections as the engineer directs, without extra cost to the owner.

V. REINFORCING MATERIAL PROPERTIES

1. REINFORCING PROPERTIES:

		FY, KSI	ASTM
A.	All bars unless noted	60	A615
B.	Ties & stirrups	60	A615
C.	Welded wire fabric (smooth)	65	A185
D.	Post-tensioning strand	270Fpu	A416
E.	Pre-stressing strand	270Fpu	A416
F.	Weldable rebar	60	A706

VI. EXPANSION AND CONTROL JOINTS

A. Control joints are to encompass an area not greater than 400 sq. ft. The minimum distance between control joints is 15'-0". Control joints shall be placed at mid span between grade beams parallel to control joint. Contractor shall submit control joint layout plan for review by architect and engineer prior to construction of slab.

VII. CAST IN PLACE CONCRETE

1. Materials
   A. Cement:
   Portland Cement shall conform to the standard specifications for Portland cement, ASTM Designation C-150, latest version Type I or Type III.
   B. Concrete Aggregates:
   Concrete aggregates shall conform to the specifications for Concrete Aggregates, ASTM C-33, latest version Type I or Type III.
   C. Water:
   Water shall be clean, potable and free of injurious amounts of acids, alkalis or organic materials.
   D. Ready Mixed Concrete:
   Ready Mixed Concrete shall conform to ASTM Specifications C-94, latest version.
   E. Expansion joints (if shown):
   Pre-molded joint filler shall consist of asphalt vegetable fiber and mineral filler between two sheets of asphalt saturated paper and shall meet the requirements of ASTM Specification D-994, latest version.
   F. Admixtures:
   Chemical compounds shall be used as an Admixture to control plastic shrinkage, improved workability and entrain 3 to 5% air. The Admixtures shall contain no chlorides, fluorides or nitrates and shall be formulated by the manufacturer for the job area and weather conditions to control setting time. Admixtures shall conform to ASTM Specifications C-260 and C-494, latest versions. The Admixtures intended for use shall be submitted to the Engineer for approval before any actual mix is made.
2. Place concrete in compliance with practices and recommendations of ACI 304.
   A. Cold Weather Placing: Comply with ACI 306.
   B. Hot Weather Placing: Comply with ACI 305.
   C. Batching, Mixing & Delivery: Comply with ACI C94.
3. ALL CONCRETE SHALL BE CONSOLIDATED BY USE OF A MECHANICAL VIBRATOR.
4. The maximum time interval between the addition of mixing water and/or cement to the batch, and the placing of the last of the concrete batch in the forms shall not exceed ninety (90) minutes for ambient temperatures below 90 degrees and sixty (60) minutes for ambient temperatures of 90 degrees and above.
5. No concrete shall be placed where the concrete temperature exceeds 90 degrees Fahrenheit, before any water is added at the jobsite.
6. Reinforcing bars shall be designed, fabricated and placed in accordance with the latest ACI Specifications.
7. Continuous reinforcing bars shall have a minimum lap of 40 diameters or 24", whichever is greater.
8. Provide corner bars for all continuous reinforcing bars at all corners with minimum lap of 40 diameters or 24", whichever is greater.
9. Welded Wire Fabric (W.W.F.) shall conform to ASTM A185.
10. Non-shrink grout shall be ready-to use metallic aggregate product requiring only additions of water at the site, and shall have the following attributes:
    A. Be capable of producing a flowable grouting material having no drying shrinkage or settlement at any age.
    B. The compressive strength of the grout (50mm or 2" cubes) shall be not less than 5,000 psi at age 28 days. Store, mix and place non-shrink grout in strict accordance with manufacturer's recommendations, as approved by the Engineer.
11. Provide 1/2" pre-molded expansion joints where new concrete walks abut the building, existing curbs and walks.
12. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to form seams or planes of weakness within the section.
13. Where a section cannot be placed continuously, provide construction joints as approved by the Engineer.
14. Place concrete at such a rate that concrete which is being integrated with fresh concrete is still plastic.
15. Deposit concrete as nearly as practicable in its final location to avoid segregation due to re-handling and flowing. Do not subject concrete to any procedure which might cause segregation. Do not use mechanical vibrators to move concrete.
16. Screed concrete which is to receive other construction to the proper level to avoid excessive shimming and grouting.
17. Do not use concrete that has become non-plastic and unworkable, or does not meet the required quality control limits or which has been contaminated by foreign materials.
18. Do not re-temper concrete after initially obtaining the proper slump on any load of concrete.
19. All reinforcing shall be supported on metal supports and securely tied to prevent movement during concreting.
20. All concrete shall be designed and constructed in accordance w/ IBC Chapter 19 & ACI-318, latest editions.
21. Provide extra reinforcing on each face around all openings 24" or larger in all slabs & walls equal to half the interrupted reinforcing bars on each side but not less than 2 - #5 bars with Class B lap but not less than 2 feet beyond edge openings.
22. Provide a 3/4" chamfer on all exposed corners of concrete.
23. The following minimum concrete cover shall be provided for reinforcement:

	MINIMUM COVER IN.
A. Concrete cast against & permanently exposed to earth :	3"
B. Concrete exposed to earth or weather: #6 THRU #18 bars	2"
#5 & smaller bars	
C. Concrete not exposed to weather or in contact with ground: slabs & walls: #14 & #18 bars	1-1/2"
#11 & smaller bars	2"
	1"
Beams & Columns: Primary reinforcement, ties & stirrups	1"

24. If any ponds, tree wells or abrupt grade changes occur within 5'-0" of perimeter grade beam, the grade beam must be extended a minimum of 12" below the lowest elevation of the grade change.
25. Under-slab vapor barrier shall be StegoWrap 15 mil. Or equal. Vapor retarder shall be installed in accordance with manufacturer's specifications.
26. All anchor bolts and shearwall hold down bolts are to be "wet set". Do not drill any epoxy set hold down or anchor bolts.

CONCRETE MATERIAL PROPERTIES

1. CONCRETE PROPERTIES:

		F'c PSI 28 DAYS	SLUMP INCHES
A.	Footings, piers, grade beams & foundation walls	3000	4 ± 1
B.	Interior slab on grade	3000	5 ± 1
C.	Exterior slab on grade	3000	5 ± 1
D.	Topping & concrete over metal deck	3500	5 ± 1

2. All exterior concrete shall be air entrained to give the concrete an air content of 6 ± 1% by volume.
3. Cast-In-Place concrete shall be regular weight with a minimum compressive strength of 3000 psi at 28 days. The concrete mix design shall have a minimum of 5 sacks of cement for 3000 psi and 5-1/2 sacks for 3500 psi per cubic yard of concrete. The mix design shall be prepared by a testing agency and reviewed by the Engineer prior to placing any concrete. All concrete shall be by one supplier unless approved by the Engineer. The use of Fly Ash is not permitted.
4. Concrete shall have a maximum slump of 5" for slabs and 4" for all other concrete.

VIII. MASONRY

1. All CMU Walls to be reinforced with (1) #4 Vertical at 16' O.C. There shall also be (3) #4 Verticals at each corner, (4) #4 Verticals at each wall intersection and (2) #4 Verticals at each side of each opening, at wall ends and at control joints. There shall be (1) #4 Vertical per CMU block cell at each location noted above with each cell being filled with 3000 psi concrete in 4'-0" lifts maximum.
2. All CMU Walls to be reinforced horizontally with 3/16" Dur-O-Wall at 16' O.C. vertically. Dur-O-Wall to be basic bright wire with deformed side rods. Dur-O-Wall to be fully embedded in the mortar with a minimum of 5/8" cover on exterior faces. All splices shall be a minimum of 6". Bend and hook side rods at ends of walls and at openings.
3. Mortar shall be Type S, with a minimum compressive strength of 1800 psi at 28 days.
4. Control joints shall be placed at a minimum of 24'-0" spacing and at either side of each opening 6'-0" or greater or one side of other openings. Each control joint shall be properly reinforced to provide lateral support.
5. Bond Beams shall be placed at the floor and roof level and at a maximum vertical spacing of 8'-0". The bond beam shall consist of an 8" CMU with (1) #5 continuous and filled with 3000 psi concrete.

IX. STRUCTURAL STEEL

1. Structural Steel design and construction shall conform to IBC Chapter 22, - General design requirements. All steel shall be designed, fabricated and erected in accordance with the latest AISC Specifications for Design, Fabrication and Erection of Structural Steel for Buildings.
2. All welding shall be in accordance with the latest American Welding Society Specifications.
3. All structural steel shall be ASTM A992.
4. All bolts shall be ASTM A307.
5. All steel to be given one shop coat of rust inhibitive primer, after fabrication.
6. Structural Steel Supplier is responsible for & shall submit shop drawings for all structural steel.
7. Structural Steel Supplier shall furnish bolts for OSHA connections (see drawings for details).
8. Provide protective asphaltic coating or equal around structural steel below grade.

STEEL MATERIAL PROPERTIES

1. STEEL PROPERTIES:

		FY, PSI	ASTM
A.	Structural wide flange shapes	50,000	A992
B.	Other structural shapes, etc.	36,000	A36
C.	High strength bolts, U.N.O.	74,000	A325
D.	Anchor bolts (tensile strength)	60,000	A307
E.	Welding electrodes	E70XX	A233
F.	Deck welding electrodes	E60XX	A233
G.	Structural pipes	36,000	A53, GRADE B
H.	Structural tubes	46,000	A500, Grade B
I.	Headed studs	50,000	A108
J.	Expansion Bolts shall be Epcon Epoxy Anchors or pre-approved equal.		

X. STEEL JOISTS

1. Steel joists shall be manufactured by a member of SJI.
2. Steel joists shall be designed, fabricated and erected in accordance with the 2005 STEEL JOIST INSTITUTE STANDARD SPECIFICATIONS.
3. No construction loads of any kind shall be placed on unbridged joists.
4. Where columns are not framed in at least two directions with structural steel members, joists at or closest to column lines shall be field bolted to add lateral stability during construction.
5. Provide bridging in accordance with the latest edition of the SJI STANDARD SPECIFICATION AND OSHA REQUIREMENTS.
6. The structural drawings are not stand alone documents. The joist supplier shall coordinate the locations and weights of all mechanical, plumbing, electrical and other equipment with the applicable drawings. The joist supplier shall account for the loads in their design.
7. Steel joist manufacturer shall design roof joists supporting mechanical units for 1.2x mechanical weights shown. Use [20] PSF live load (non-reducible) unless noted otherwise. Contractor shall verify actual mechanical loads. Notify steel joist manufacturer of any descrepancies.
8. Steel joists shall be designed for a net wind uplift of [15] PSF unless note otherwise.
9. The dead load of miscellaneous rooftop items, including screen wall, skylights, etc. shall be accounted for in the design of the steel roof joists.

XI. USE AND/OR RELEASE OF STRUCTURAL ENGINEERING ELECTRONIC FILE

The electronic files for the structural engineering documents will not be released for use during construction for the preparation of shop drawings or submittals. Each supplier or fabricator is responsible for reproducing the information required for their submittal. The duplicating of any part of these documents for inclusion in shop drawings or submittals is also prohibited. Files may be released to contractor for preparation of as-builts or for performing quantity estimates.

XII. DETAIL NOTES

Details noted as typical shall apply in all cases unless specifically shown or noted otherwise.

XIII. STRUCTURAL REQUIREMENTS FOR SUBMITTALS

The following are submittals required by Engineer. Use plans and spec. book for product list.

1. Select fill material
2. Soil compaction test results
3. Reinforcement & concrete accessories including vapor barrier
4. Concrete mix design
5. Anchor bolts
6. CMU block and accessories
7. Mortar mix design, grout mix design and test results
8. Structural steel
9. Concrete test results

XIV. STRUCTURAL REQUIREMENTS FOR SITE VISITS

Site visits for construction observation will not be made by Engineer until all submittals and/or testing results have been reviewed and accepted by the Engineer. Contractor is responsible for scheduling submittals to allow the Engineer adequate time to review and comment before proceeding with construction.

Representative of Kings E360 will visit the site at the following stages of construction:

A. After forms, rebar, embeds and other accessories are in place and 48 hours prior to placement of concrete
B. All anchor bolts and embeds are to be set and adequately tied & held in position prior to the start of placing concrete
C. During construction of masonry wall while all phases of the operation are in progress, including laying up of wall courses, pouring cells and constructing bond beams
D. After steel is erected but prior to covering with other materials
E. After decking is in place and attached to the structure, but prior to covering with floor and roof materials
F. Pre-Engineered Metal Building anchor bolts (after bldg. erection complete)

Please refer to specifications or General Notes for project specific instructions.

Contractor shall issue to the engineer a complete project schedule with the above site visits noted and notify the Engineer a minimum of 48 hours prior to the scheduled visit to confirm time and date required visit. Failure of the Contractor to accomplish this notification will not require the engineer to respond on shorter notice, nor will the Contractor proceed without the Engineer performing appropriate site visit. Additionally if the Contractor requests or schedules a site visit and construction is not at the appropriate stage for the Engineer to perform the proper observations, another site visit will be required and scheduled at the Contractor expense for all time and travel expenses of the engineer or his representative. Engineer will not issue any type or form of compliance or concurrence statement for construction without performing the above noted site observations.

DRAWING SYMBOLS

LOAD BEARING MASONRY WALL
WOOD BLOCKING
WELDED WIRE FABRIC
SPAN DIRECTION OF HOLLOW CORE SLABS
COLUMN GRIDLINE & GRID DESIGNATIONS — GRID DESIGNATION (12 / A)
DETAIL TARGETS — DETAIL NUMBER / SHEET NUMBER
EARTH/COMPACT FILL
BEAM SPLICE LOCATION
BEAM MOMENT CONNECTION
PIER DIAMETER/EMBEDMENT INTO LIMESTONE STRATA (24/5)
TILTWALL PANEL NUMBER (P1)
SECTION CUTS — SECTION NUMBER / SHEET NUMBER
ELEVATION TARGET — SHEET NUMBER / ELEVATION NUMBER (1 / S101 / 1)
REVISION CLOUDS — REVISED AREA CLOUDED
12" X 12" BLOCKOUT FOR PLUMBING, REF. ARCHITECTURAL OR PLUMBING DRAWINGS FOR LOCATION
CURB STEP
TRENCH STEP
STEP W/ SLOPE
STEP DOWN
SLOPE DOWN
EXISTING CONDITION
MECHANICAL UNIT(S)

ABBREVIATIONS

A
A.B. ANCHOR BOLT
ALT. ALTERNATE
ARCH. ARCHITECTURAL)

B
B.S. BOTH SIDES
BBE BOTTOM BEAM ELEVATION
BLKG. BLOCKING
BLDG. BUILDING
BM. BEAM
BOT. BOTTOM
BRG. BEARING
BSMT. BASEMENT
BTWN. BETWEEN
BLK. BLOCK

C
C.J. CONTROL JOINT
CL CENTER LINE
CLR. CLEARANCE
C.M.U. CONCRETE MASONRY UNIT
C.B. CONCRETE BLOCK
COL. COLUMN
CONC. CONCRETE
CONN. CONNECTION
CONST. CONSTRUCTION
CONT. CONTINOUS
C.I.P. CAST IN PLACE
COMP. COMPOSITE

D
DET. DETAIL
DIA. DIAMETER
DIAG. DIAGONAL
DN. DOWN
DWG. DRAWING
DBL. DOUBLE
D.L. DEAD LOAD
DO. DITTO

E
E EAST
EA. EACH
E.S. EACH SIDE
ELEV. ELEVATION
EQ. EQUAL
EXIST. EXISTING
EXP. EXPANSION
EXT. EXTERIOR

F
FD. FLOOR DRAIN
FDN. FOUNDATION
FTG. FOOTING
FUT. FUTURE
F.S. FAR SIDE
FAB. FABRICATE (OR)
FLG. FLANGE
F.O.B. FACE OF BRICK

G
GA. GAGE, GAUGE
GALV. GALVANIZED
G.C. GENERAL CONTRACTOR)
GLB. GLUE BEAM

H
H.C.A. HEADED CONCRETE ANCHOR
HORIZ. HORIZONTAL
HT. HEIGHT
H.S. HEADED STUDS
HSS. TUBE STEEL

I
INFO. INFORMATION
I.F. INSIDE FACE

J
JST. JOIST
JT. JOINT
J.SBRG. JOIST BEARING

K
K KIP
K.O. KNOCK-OUT
K.S.I. KIPS PER SQ. INCH

L
LLH. LONG LEG HORIZONTAL
LLV LONG LEG VERTICAL
L.L. LIVE LOAD

M
MIN. MINIMUM
MAS. MASONRY
MAX. MAXIMUM
MANUF. MANUFACTURER
MEZZ. MEZZANINE
MISC. MISCELLANEOUS
M.O. MASONRY OPENING
MATL. MATERIAL
MTL. METAL

N
N. NORTH
NTS NOT TO SCALE
N.S. NEAR SIDE
N.I.C. NOT IN CONTRACT

O
O.C. ON CENTER(S)
O.C.E.W. ON CENTER EACH WAY
O.S. OUTSIDE
OPNG. OPENING
OPP. OPPOSITE
O.F. OUTSIDE FACE

P
P.C. PRECAST CONCRETE
PERIM. PERIMETER
P.J. PANEL JOINT
PL PLATE
PLF POUNDS PER LINEAR FOOT
PMB PRE-ENGINEERED METAL BUILDING
PROJ. PROJECTION
PSF POUNDS PER SQ. FOOT
PSI POUNDS PER SQ. INCH
P.T. PRESSURE TREATED

Q
QTY. QUANTITY

R
R RADIUS
R.D. ROOF DRAIN
REV. REVISION, REVISED)
REINF. REINFORCED, (ING)
REF. REFERENCE
REQ'D. REQUIRED

S
S SOUTH
SCHED. SCHEDULE
SIM. SIMILAR
SQ. SQUARE
STD. STANDARD
STL. STEEL
STRUCT. STRUCTURAL
SPA. SPACE(S)
S.L. SNOW LOAD

T
TEMP. TEMPORARY
TYP. TYPICAL
T.O. TOP OF
TBE. TOP OF BEAM ELEVATION
TDE TOP OF DECK ELEVATION
TFE. TOP OF FOOTING ELEVATION
TSE TOP OF SLAB ELEVATION
T&B TOP AND BOTTOM
T&G TONGUE AND GROOVE

U
UNSPEC. UNSPECIFIED
U.N.O. UNLESS NOTED OTHERWISE

V
VERT. VERTICAL

W
W WEST
w/ WITH
W.P. WORK POINT
W.W.F. WELDED WIRE FABRIC

DRAWING INDEX

S000 STRUCTURAL NOTES
S100 FOUNDATION & ROOF FRAMING PLAN
S300 FOUNDATION DETAILS
S400 FRAMING DETAILS

LAURENCE J. FISHER
50110
REGISTERED
PROFESSIONAL ENGINEER
01/11/2019

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Fax (512) 388-3698
TBPE Registration No. F-19495
JOB NO. 180406

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Williamson County, Texas

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 01/11/2019
SHEET TITLE: STRUCTURAL NOTES
DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
S000

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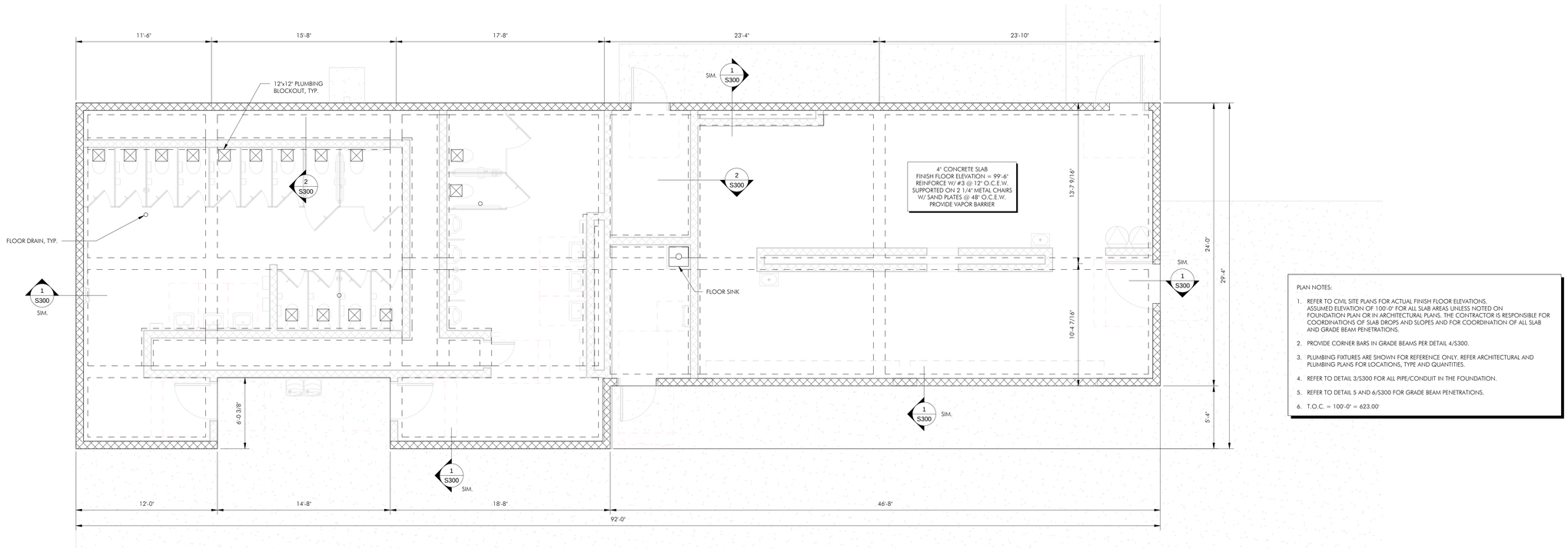


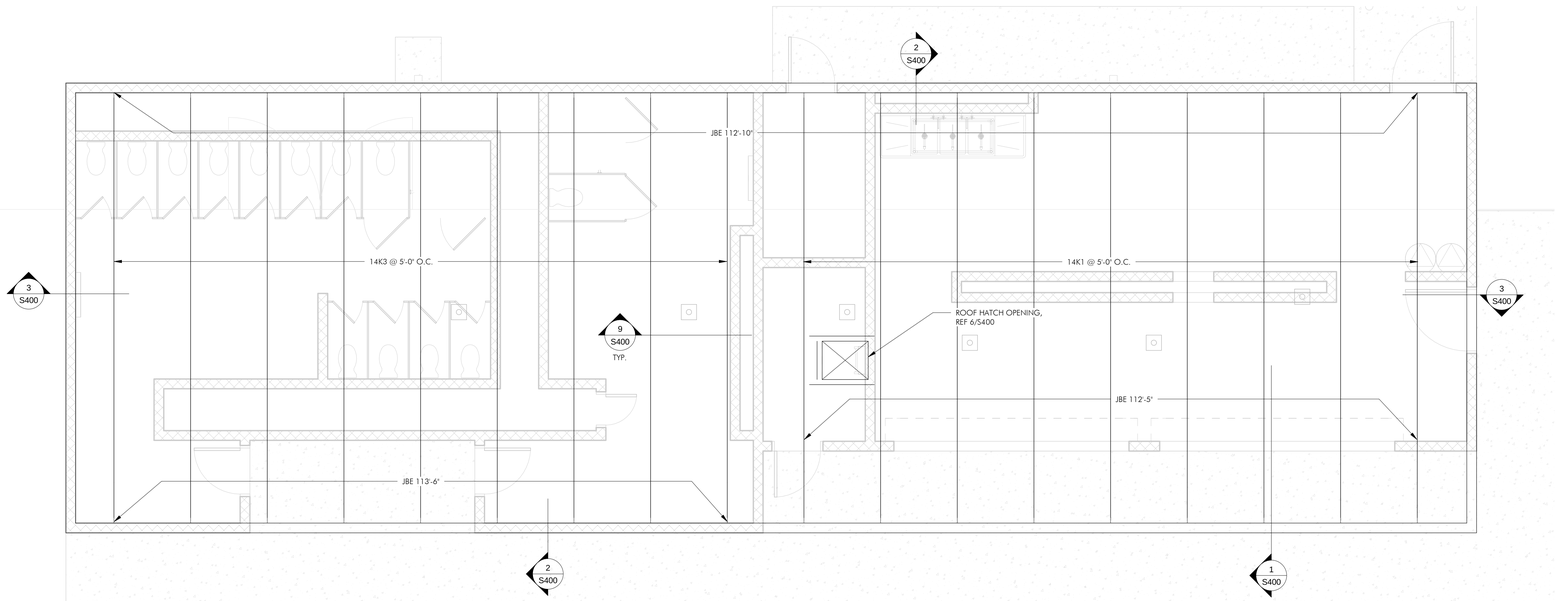
PLAN NOTES:

1. REFER TO CIVIL SITE PLANS FOR ACTUAL FINISH FLOOR ELEVATIONS. ASSUMED ELEVATION OF 100'-0" FOR ALL SLAB AREAS UNLESS NOTED ON FOUNDATION PLAN OR IN ARCHITECTURAL PLANS. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATIONS OF SLAB DROPS AND SLOPES AND FOR COORDINATION OF ALL SLAB AND GRADE BEAM PENETRATIONS.
2. PROVIDE CORNER BARS IN GRADE BEAMS PER DETAIL 4/S300.
3. PLUMBING FIXTURES ARE SHOWN FOR REFERENCE ONLY. REFER ARCHITECTURAL AND PLUMBING PLANS FOR LOCATIONS, TYPE AND QUANTITIES.
4. REFER TO DETAIL 3/S300 FOR ALL PIPE/CONDUIT IN THE FOUNDATION.
5. REFER TO DETAIL 5 AND 6/S300 FOR GRADE BEAM PENETRATIONS.
6. T.O.C. = 100'-0" = 623.00'

NORTH

A | EAST CONCESSION & RESTROOM FOUNDATION PLAN

1/4" = 1'-0"



NORTH

B | EAST CONCESSION & RESTROOM ROOF FRAMING PLAN

1/4" = 1'-0"

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1 | E | D | C | A | B | F2

PROJECT NO. 14.3903 | ISSUED BY POPULOUS

ISSUED DATE: 01/11/2019

SHEET TITLE:

FOUNDATION & ROOF FRAMING PLAN

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

S100

STATE OF TEXAS
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PROJECT NORTH

NORTH

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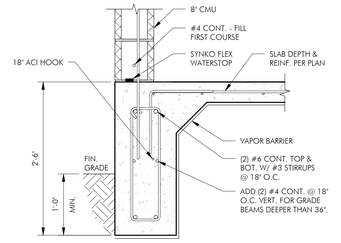

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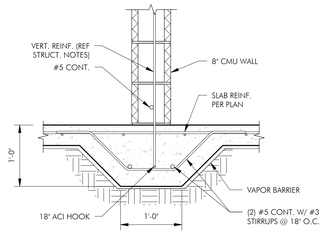

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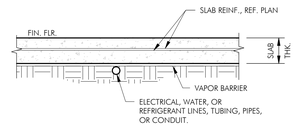
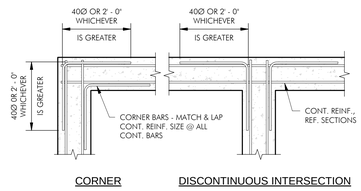
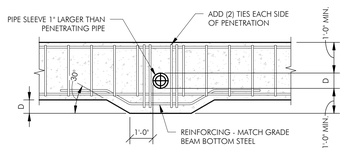


3 TYPICAL SLAB OVER UTILITIES DETAIL
1" = 1'-0"

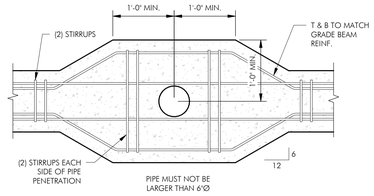


CORNER DISCONTINUOUS INTERSECTION

4 TYP. GRADE BEAM REINF. DETAIL
1" = 1'-0"



5 TYP. GRADE BM. PENETRATION DETAIL
1" = 1'-0"



GRADE BEAM PLAN

6 TYP. GRADE BM. PENETRATION DETAIL
1" = 1'-0"

NOT USED

NOT USED

NOT USED

NOT USED

NOT USED

NOT USED

NOT USED

NOT USED

NOT USED

NOT USED

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Williamson County, Texas

CONSTRUCTION DOCUMENTS
1/11/2019

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F1
E D C A B
F2

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 01/11/2019

SHEET TITLE:
FOUNDATION DETAILS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
S300

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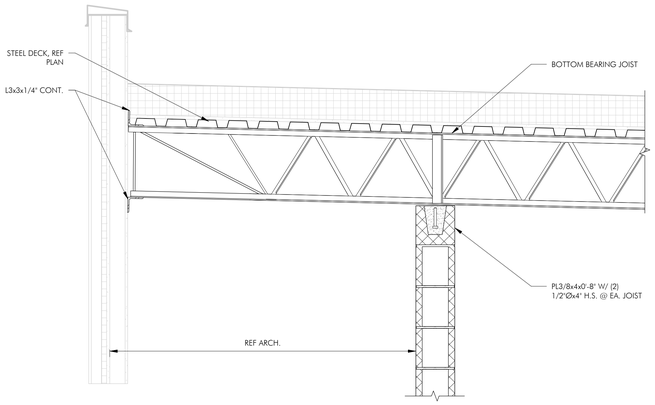

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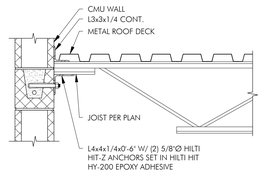
1" = 1'-0"



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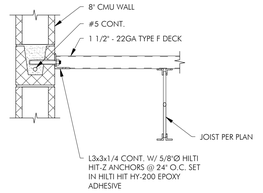


3 SECTION
1" = 1'-0"

LOOSE STEEL LINTEL SCHEDULE

NOTE: PROVIDE 8" MINIMUM BEARING EACH END FOR STEEL LOOSE LINTELS. ONE ANGLE SHALL BE PROVIDED FOR EACH WYTHE OF BRICK. SEE ARCHITECTURAL DRAWINGS FOR LOCATION.

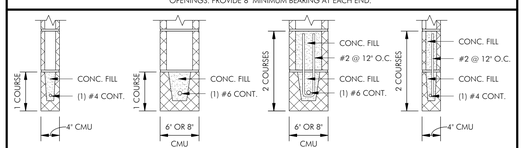
MASONRY OPENING	SIZE	DETAIL
LESS THAN 4'-0"	L 3 1/2 X 3 1/2 X 1/4	L
4'-0" BUT LESS THAN 5'-0"	L 4 X 3 1/2 X 1/4	L
5'-0" BUT LESS THAN 6'-0"	L 5 X 3 1/2 X 1/4	L
6'-0" BUT LESS THAN 7'-0"	L 6 X 3 1/2 X 5/16	L
7'-0" BUT LESS THAN 8'-0"	L 6 X 4 X 3/8	L
8'-0" BUT LESS THAN 9'-0"	L 7 X 4 X 3/8	L
9'-0" BUT LESS THAN 10'-0"	L 8 X 4 X 1/2	L

ALL LINTELS ARE TO BE HOT DIPPED GALVANIZED.

4 LOOSE STEEL LINTEL SCHEDULE
12" = 1'-0"

BLOCK LINTEL SCHEDULE

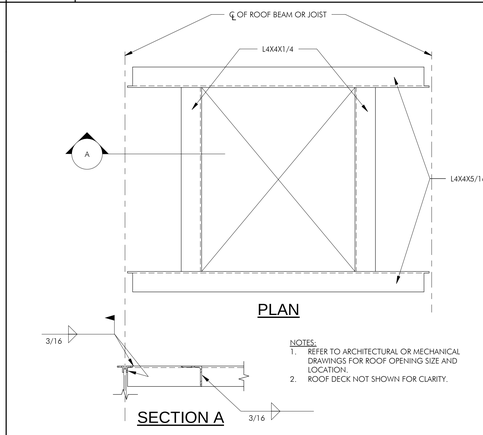
NOTE: PROVIDE BLOCK LINTELS FOR ALL OPENINGS IN INTERIOR BLOCK PARTITIONS AND IN EXTERIOR BLOCK WALLS FOR WHICH STEEL LINTELS ARE NOT SCHEDULED. SEE ARCHITECTURAL DRAWINGS FOR SIZE AND LOCATION OF OPENINGS. PROVIDE 8" MINIMUM BEARING AT EACH END.



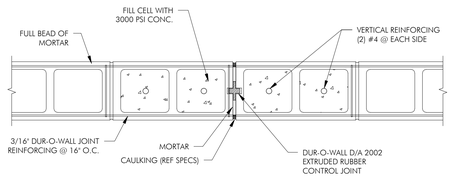
OPENINGS LESS THAN 5'-0" WIDE

OPENINGS 5'-0" TO 10'-0" WIDE

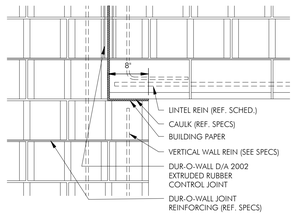
5 BLOCK LINTEL SCHEDULE
1" = 1'-0"



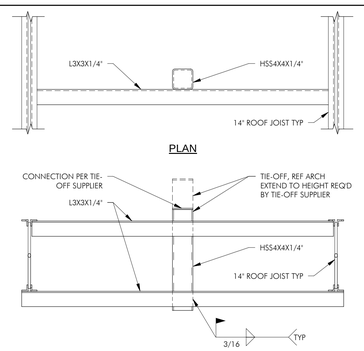
6 TYPICAL ROOF HATCH OPENING
1" = 1'-0"



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



8 TYP. CMU LINTEL BEARING
1" = 1'-0"



9 TIE-BACK DETAIL
1" = 1'-0"

NOT USED

NOT USED

NOT USED

NOT USED

POPULOUS

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Taylor, Texas 76574

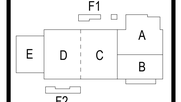
Williamson County, Texas

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 01/11/2019
SHEET TITLE: FRAMING DETAILS
DISCIPLINE - CATEGORY - SUB-CATEGORY - SHEET: S400

STATE OF TEXAS
LAURENCE J. FISHER
50110
REGISTERED PROFESSIONAL ENGINEER
01/11/2019

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ABBREVIATIONS

&	AND
∠	ANGLE
@	AT
℄	CENTERLINE
[	CHANNEL
Ø	DIAMETER OR ROUND
#	NUMBER OR POUND
₹	PLATE
SF	SQUARE FOOT (FEET)
ACOUST	ACOUSTICAL
AD	AREA DRAIN
ADJ	ADJUSTABLE
AFF	ABOVE FINISH FLOOR
AHU	AIR HANDLING UNIT (RE: MECH)
ALUM	ALUMINUM
AP	ACCESS PANEL
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AV	AUDIO/VISUAL
BD	BOARD
BLDG	BUILDING
BLKG	BLOCKING
BM	BEAM
BRG	BEARING
CJ	CONTROL JOINT
CG	CORNER GUARD
CIP	CAST-IN-PLACE
CLG	CEILING
CLO	CLOSET
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACTOR
COOR	CORRIDOR
COPY	COPIER
CTR	CENTER
DBL	DOUBLE
DEPT	DEPARTMENT
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIM	DIMENSION
DN	DOWN
DR	DOOR
DS	DOWN SPOUT
DTL	DETAIL
DW	DISH WASHER
DWG(S)	DRAWING(S)
E	EAST
EA	EACH
E	ELEVATION
EJ	EXPANSION JOINT
ELEC	ELECTRICAL
ELEV	ELEVATOR
EMS	ENERGY MANAGEMENT SYSTEM PC
EOS	EDGE OF SLAB
EQ	EQUAL
EQUIP	EQUIPMENT
ESP	ELEVATOR STATUS PANEL
EWC	ELECTRIC WATER COOLER
EXP	EXPANSION
EXIST	EXISTING
EXT	EXTERIOR
FAP	FIRE ALARM PANEL
FD	FLOOR DRAIN
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FFE	FURNISHINGS, FIXTURES, EQUIPMENT
FFD	FUNNEL FLOOR DRAIN
FHC	FIRE HOSE CABINET
FIN	FINISH
FL	FLOOR
FOC	FACE OF CONCRETE
FOF	FACE OF FINISH
FOS	FACE OF STUD
FR (FRM)	FRAME
FS	FLOOR SINK
FT	FOOT OR FEET
FTG	FOOTING
FURR	FURRING
FV	FIELD VERIFY
FVC	FIRE VALVE CABINET
GA	GAUGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GL	GLASS
GYP BD	GYPSUM BOARD
HB	HOSE BIBB
HC	HOLLOW CORE
HD	HEAD
HDW	HARDWARE
HDWD	HARDWOOD
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HT	HEIGHT
ICE	ICE MAKER
ID	INSIDE DIAMETER / DIMENSION
IN	INCH
INFO	INFORMATION
INSUL	INSULATION
INT	INTERIOR
JAN	JANITOR
JT	JOINT
JST	JOIST
KIT	KITCHEN
KO	KNOCKOUT
L	LONG / LENGTH
LT (LTG)	LIGHT (LIGHTING)
LWC	LIGHTWEIGHT CONCRETE
M	METER
MAS	MASONRY
MAX	MAXIMUM
MECH	MECHANICAL
MFG	MANUFACTURING
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MTD	MOUNTED
MTL	METAL
N	NORTH
N / A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NPS	NATIONAL PIPE STANDARD
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER / DIMENSION
OFF	OFFICE
OH	OPPOSITE HAND
OPNG	OPENING
ORD	OVERFLOW ROOF DRAIN
OVHD	OVERHEAD
OZ	OUNCE
PA	PUBLIC ADDRESS
PC	PRECAST CONCRETE
PL	PLATE
PLAS	PLASTER
PLBG	PLUMBING
PLYWD	PLYWOOD
POL	POLISHED
PR	PAIR
PT	POINT
PTD	PAINTED
QTY	QUANTITY
R	RISER OR RADIUS
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
RE	REFERENCE REINFORCED
REFER	REFRIGERATOR
REINF	REINFORCED
REQ'D	REQUIRED
REV	REVISION
RM	ROOM
RO	ROUGH OPENING
RTU	ROOF TOP UNIT (RE: MECH)
S	SOUTH
SAN	SANITARY
SC	SOLID CORE
SCHED	SCHEDULE
SD	SCUPPER DRAIN
SECT	SECTION
SF	SQUARE FOOT (FEET)
SH	SHOWER
SHT	SHEET
SP	SPACING
SPEC	SPECIFICATION
SPHD	SPRINKLER HEAD
SPKR	SPEAKER
SQ	SQUARE
SS	STAINLESS STEEL
SSE	SECURITY SYSTEM EQUIPMENT
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURE / STRUCTURAL
SY (SQ YD)	SQUARE YARD(S)
SHT	SHEET
T	TREAD
TEL	TELEPHONE
TEMP	TEMPERED
T&G	TONGUE AND GROOVE
TOC	TOP OF CONCRETE
TOD	TOP OF DECK
TOP	TOP OF PARAPET
TOS	TOP OF SLAB OR TOP OF STEEL
TOW	TOP OF WALL
TV	TELEVISION
TYP	TYPICAL
UNO	UNLESS OTHERWISE NOTED
VB (VPR BR)	VAPOR BARRIER
VEND	VENDING MACHINES
VERT	VERTICAL
VEST	VESTIBULE
W	WEST OR WIDE OR WIDTH
W /	WITH
W / I	WITHIN
W / O	WITHOUT
W / D	WASHER / DRYER
WD	WOOD
WDW	WINDOW
WND	WINDOW
WP	WATERPROOF
WT	WEIGHT
WTCS	WALKIE TALKIE CHANGING STATION

GRAPHIC SYMBOLS

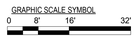
COLUMN AND / OR GRID LINES

FLOOR PLAN MATCHLINE SYMBOL

CENTERLINE SYBMOL / GRID LINE

EXPANSION JOINT LOCATION LINES

GRAPHIC SCALE SYMBOL



NORTH ARROW SYMBOL

MATERIAL KEYNOTE SYMBOL

SPOT ELEVATION SYMBOL

FLOOR ELEVATION LEVEL SYMBOL

DETAIL REFERENCE SYMBOLS

EXTERIOR BUILDING SECTION SYMBOL

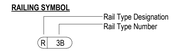
BUILDING/WALL SECTION SYMBOL

DETAIL SECTION SYMBOL

BUILDING ELEVATION SYMBOL

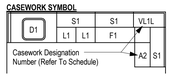
INTERIOR ELEVATION/DETAIL SYMBOL

RAILING SYMBOL

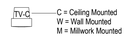


REVISIONS SYMBOL

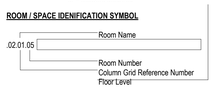
CASEWORK SYMBOL



TELEVISION SYMBOL



ROOM / SPACE IDENIFICATION SYMBOL



DOOR NUMBER AND TYPE SYMBOL

Each door number indicates the room / space and is alphabetized when more than one door exists for one room / space.

FIRE EXTINGUISHER SYMBOLS

FE SMB — FIRE EXTINGUISHER & SURFACE MOUNTED BRACKET

DIMENSIONING CRITERIA

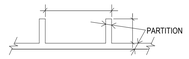
All drawings are intended to be complementary. Notify the architect of any dimensioning discrepancy prior to proceeding.

Dimensions are to face of concrete and CMU walls (nominal dimensions).

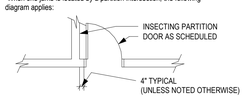
Dimensions are to outside face of gypsum board / stud walls.

Dimensions are as identified on the documents or as established by criteria as follows:

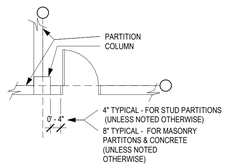
1. DIMENSIONS WILL NOT BE SHOWN FOR THE FOLLOWING CONDITIONS:
-When partition is centered on grid line.
-When partition is shown flush with column face.
-When partition is shown flush with grid line.
When face of partition is centered on glazing mullion.
2. MASONRY / METAL STUD WALLS ARE DIMENSIONED FROM FINISHED FACE.



3. FOR OPENINGS IN PARTITIONS OR WALLS:
-When one occurs at gridline, no dimensions will be shown and width will be established by either criteria or schedules
-When neither jamb occurs at a partition intersection, at a column or at a gridline: one jamb will be located dimensionally by the detail.
-When one jamb is located by a partition intersection, the following diagram applies:



WHEN ONE JAMB IS LOCATED BY A COLUMN, THE FOLLOWING DIAGRAM APPLIES:



REFLECTED CEILING PLAN SYMBOLS

- 2' x 4' LAY-IN-GRID
- 2' X 2' LAY-IN-GRID
- H.H. — H.H. DENOTES HIGH HUMIDITY GRID SYSTEM IS REQUIRED IN SPACE
- SECURITY SYSTEM DEVICE
- CEILING-MOUNTED FIRE ALARM DEVICE
- FIRE SPRINKLER HEAD
- SPEAKER
- CABLE TELEVISON DEVICE
- 2' x 4' FLUORESCENT FIXTURE IN GRID
- 1' x 4' FLUORESCENT FIXTURE IN GRID
- 2' x 2' FLUORESCENT FIXTURE IN GRID
- STRIP FLUORESCENT LIGHT FIXTURE
- RECESSED CAN LIGHT FIXTURE
- WALL MOUNTED LIGHT FIXTURE
- PENDANT MOUNTED LIGHT FIXTURE
- SURFACE MOUNTED CAN LIGHT FIXTURE
- SUPPLY DIFFUSER
- RETURN AIR GRILLE OR EXHAUST
- DRYWALL CEILING OR SOFFIT

- EARTH
- AGGREGATE FILL
- CONCRETE
- HEAVY BROOM FINISH OR POLYLAST
- BRICK IN PLAN
- CONCRETE MASONRY UNITS (AR-CONC)
- CUT/CAST STONE
- STEEL
- MORTAR NET
- DISCONTINUOUS ROUGH LUMBER
- CONTINUOUS LUMBER
- RIGID INSULATION
- BLANKET INSULATION
- FIRE SAFING INSULATION
- INSULATED METAL PANEL
- GROUT
- LATH & PLASTER
- GYPSUM BOARD
- MARBLE / GRANITE
- ACOUSITCAL TILE / BOARD
- WOOD GRAIN
- PLYWOOD
- FINISH LUMBER
- DRYWALL CEILING OR SOFFIT

PARTITION TYPE LEGEND

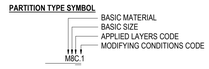
BASIC MATERIAL:
A ALUMINUM FRAMING
C CONCRETE (RE: STRUCT)
D TO BE DEMO/LISHED
M MASONRY
S STUD

BASIC SIZE:
0 7/8" FURRING
1 1 5/8" STUD
2 2 1/2" STUD
3 3 5/8" STUD
4 4" CONCRETE, MASONRY OR STUD
6 6" CONCRETE, MASONRY OR STUD
7 6" CH STUD (SHAFTWALL CONSTRUCTION)
8 8" CONCRETE, MASONRY OR STUD

PARTITION CONDITIONS:
1 ACOUSTICALLY RATED WALL (NOT USED)
2 WALL EXTENDS TO 6" ABOVE ADJOINING CEILING. BRACE TOP OF METAL STUD PARTITIONS TO STRUCTURE AND ADJOINING WALLS. REINFORCE CANTILEVERED MASONRY WALLS. NOTE: IF NO CEILING EXISTS THEN STUDS AND GYPSUM BOARD (ON EXPOSED SIDE OF PARTITION) EXTEND TO STRUCTURE.
3 WALL EXTENDS TO CEILING ABOVE
4 PARTIAL HEIGHT WALL - REFER TO SECTION AND/OR DETAILS FOR ADDITIONAL INFORMATION
5 FIRE-RATED PARTITION
6 TILE BACKER BOARD TO HEIGHT OF THE TILE WITH GYPSUM BOARD TO STRUCUTRE ABOVE (NOT USED)
7 TILE BACKER BOARD TO HEIGHT OF THE TILE WITH GYPSUM BOARD TO 6" ABOVE ADJOINING (NOT USED) CEILING. (SEE CONDITION 2 FOR ADDITIONAL REQUIREMENTS)
8 WALL EXTENDS TO 10'-0" AFF
9 CMU TO 12'-0" AFF w/ 5BH TO STRUCTURE (NOT USED)
10 CMU TO 12'-0" AFF w/ 5BHA TO STRUCTURE (NOT USED)
11 WALL EXTENDS TO 12'-0" AFF

GENERAL SCHEDULE NOTES:
1 ALL PARTITIONS EXTEND TO STRUCTURE ABOVE UNLESS NOTED OTHERWISE
2 ALL EXPOSED BURNISHED CMU CORNERS TO BE BULL NOSED

PARTITION TYPE SYMBOL



FIRE & SMOKE RATED PARTITION INDICATION

ONE HOUR FIRE RATED PARTITION

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Architecture, Planning, Interiors, Programming
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Kansas City, Missouri 64105
816/ 221-1500

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Hendrix Consulting Engineers
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Audio/ Visual Consultant
True North Consulting
6807 Woodway Drive, Suite 3
Woodway TX, 76712
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WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

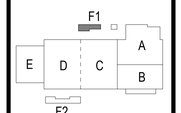
5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO. 14.3903 — ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
SYMBOLS/ PARTITION TYPES/ ABBREVIATIONS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
A0-01

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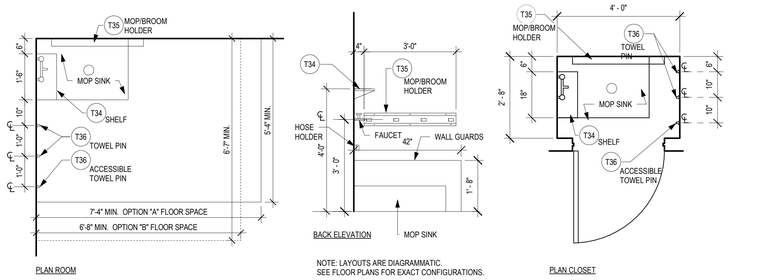
1/11/2019 4:10:21 PM

NOT USED

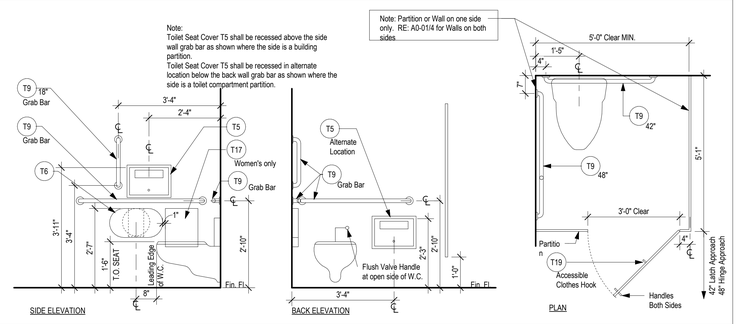
5 TYPICAL FAMILY TOILET LAYOUT
1/2" = 1'-0"



13 JANITOR'S ROOM-CLOSET
1/2" = 1'-0"

NOT USED

12 TYPICAL SHOWER ROOM
1/2" = 1'-0"



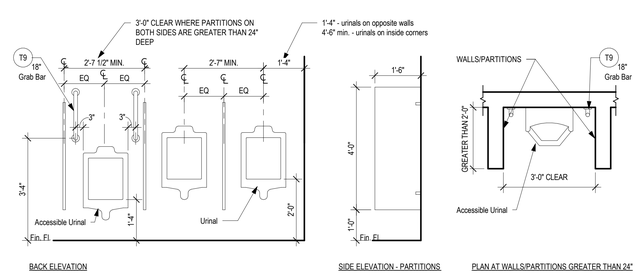
4 ACCESSIBLE TOILET STALLS TYPE 'C'
1/2" = 1'-0"

NOT USED

11 ACCESSIBLE SHOWER STALL
1/2" = 1'-0"

NOT USED

10 ENHANCED REACH LAVATORY
1/2" = 1'-0"



3 ACCESSIBLE TOILET STALLS TYPE 'D'
1/2" = 1'-0"

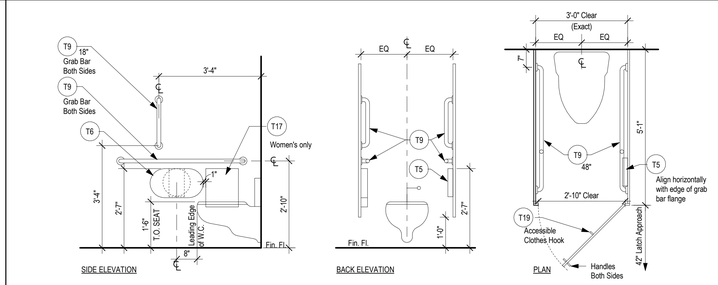
NOT USED

NOT USED

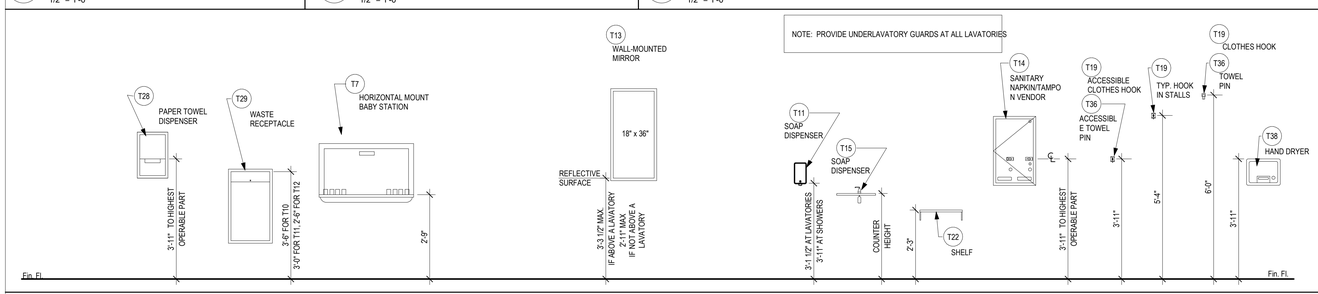
9 TOILET ACCESSORIES
1/2" = 1'-0"

8 TOILET ACCESSORIES
1/2" = 1'-0"

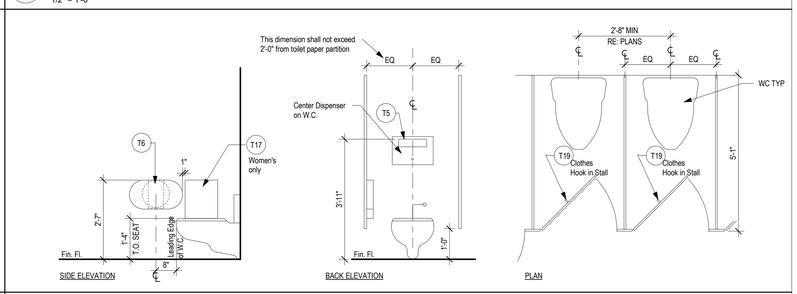
7 URINALS & URINAL PARTITIONS
1/2" = 1'-0"



2 AMBULATORY TOILET STALLS TYPE 'B'
1/2" = 1'-0"



6 ACCESSORY MOUNTING HEIGHTS
1/2" = 1'-0"



1 TYPICAL TOILET STALL TYPE 'A'
1/2" = 1'-0"

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WILLIAMSON COUNTY EXPO
EAST CONCESSION & RESTROOM
5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS
1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO. 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
TYPICAL TOILET LAYOUTS & ACCESSORIES

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
A0-02

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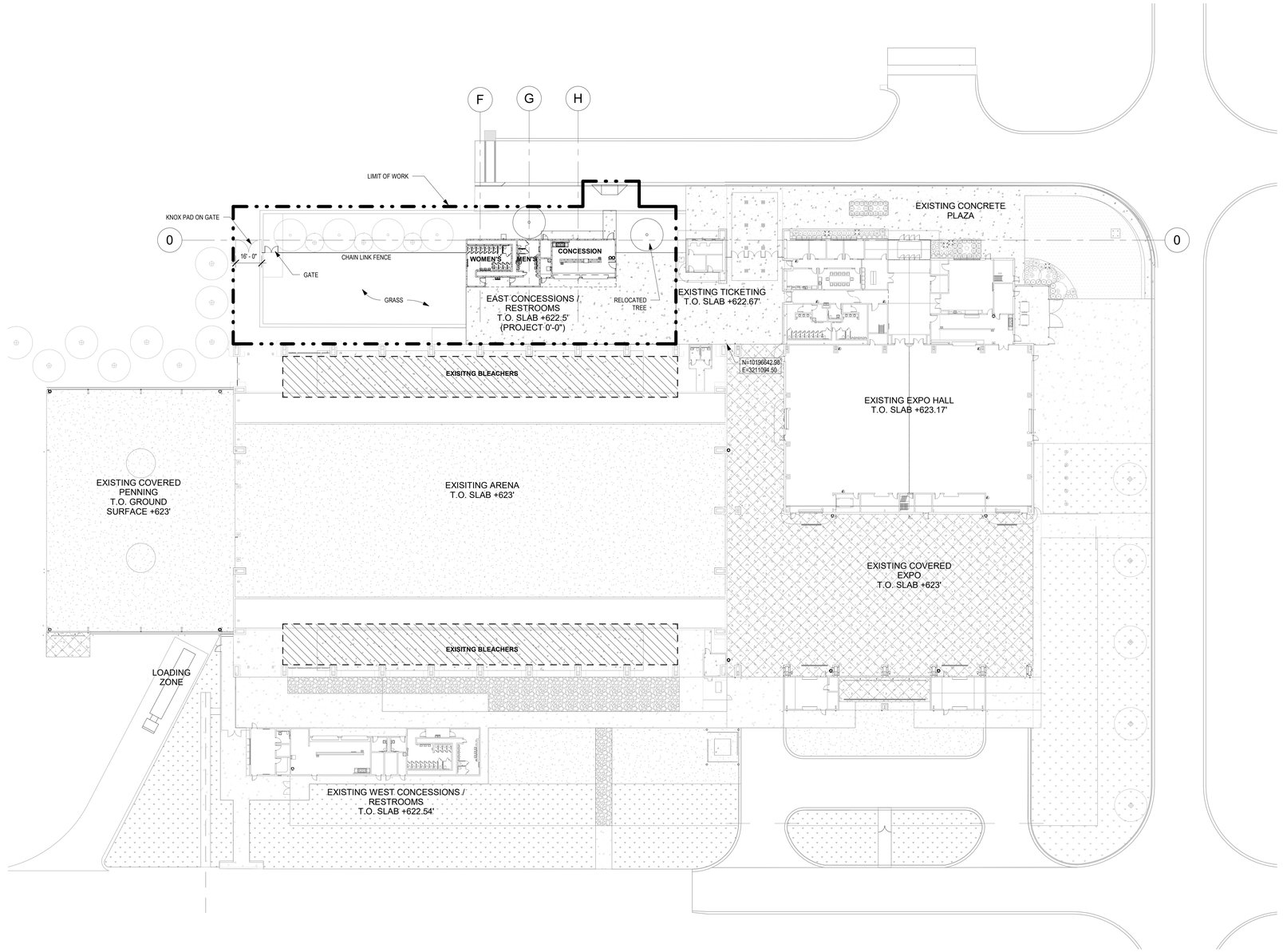

1 SITE PLAN

1" = 30'-0"

PROJECT NORTH

NORTH

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WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

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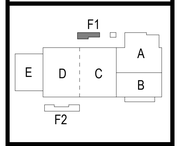
CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO. 14.3903

ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE: SITE PLAN

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

A1-1

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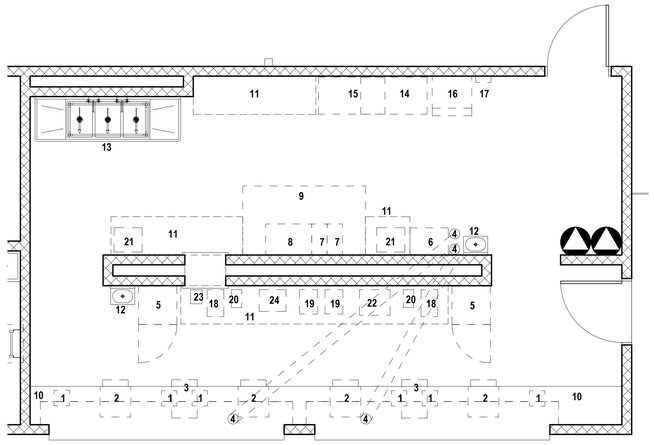
2/8/2019 12:50:54 PM

SIGNAGE SCHEDULE				
NUMBER	LOCATION	TYPE	SIZE	REMARKS
200	WOMEN	ID-01	9.31" X 8.5"	EXTERIOR
201A	MEN	ID-01	9.31" X 8.5"	EXTERIOR
202	ELECTRICAL	ID-03	3.5" X 8.5"	EXTERIOR
203	JANITOR	ID-03	3.5" X 8.5"	EXTERIOR
204A	CONCESSION	ID-03	3.5" X 8.5"	EXTERIOR
204D	CONCESSION	ID-03	3.5" X 8.5"	EXTERIOR

SIGNAGE SCHEDULE NOTES:
1. REFERENCE 10 14 01
2. PROVIDE PRELIMINARY SCHEDULE TO OWNER FOR VERIFICATION OF NUMBER AND ROOM NAME TO BE SHOWN ON INDIVIDUAL SIGNS.
3. AT SPLIT FACE WALL LOCATIONS, VERIFY WITH OWNER FOR WALL OR DOOR MOUNT.
4. MATCH EXISTING

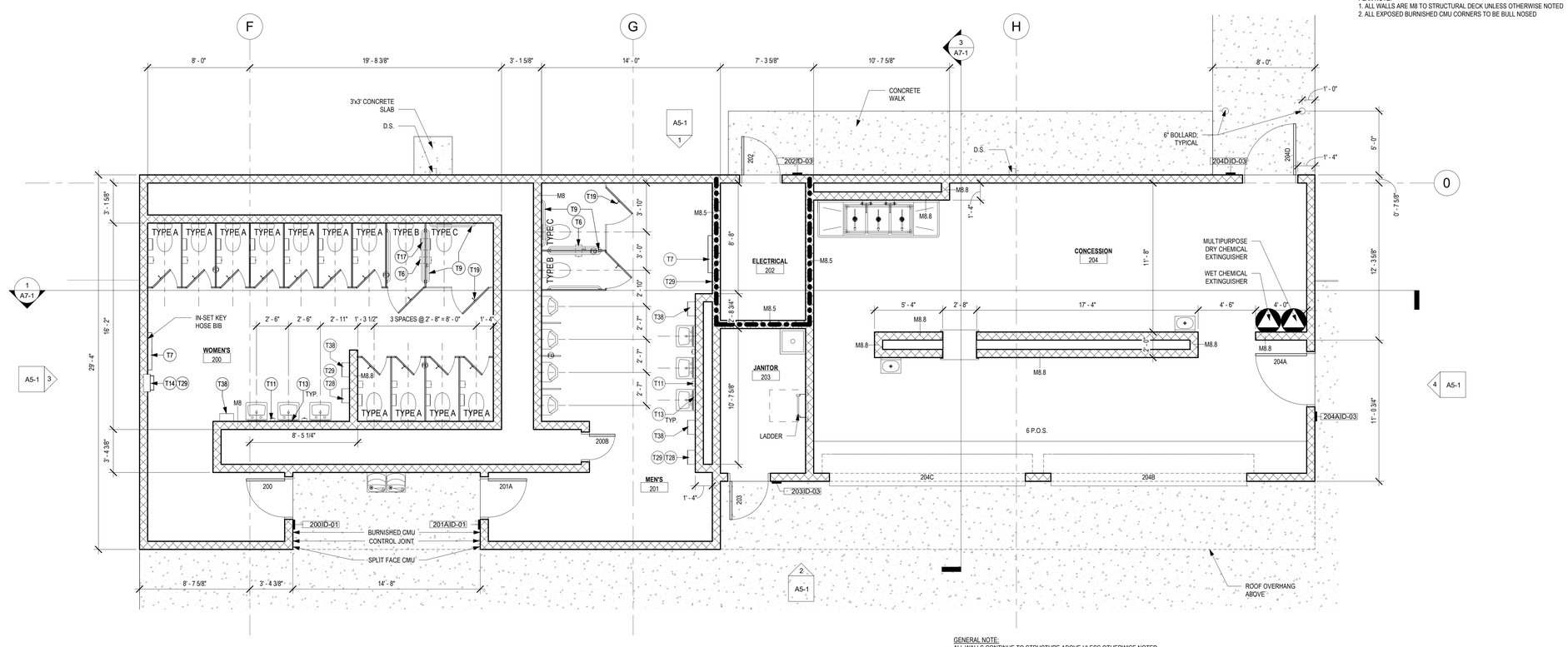


1. P.O.S. STATION (BY OWNER / N.I.C.)
2. SODA DISPENSER WITH ICE BIN (BY OWNER / N.I.C.)
3. WARMER, DRAWER TYPE (BY OWNER / N.I.C.)
4. SODA CONDUIT, 8" DIA.
5. DISPLAY COOLER (BY OWNER / N.I.C.)
6. BAG-IN-BOX RACK (BY OWNER / N.I.C.)
7. GAS DEEP FRYER, 12"x24" (BY OWNER / N.I.C.)
8. GRIDDLE, 24"x36" (BY OWNER / N.I.C.)
9. EXHAUST HOOD
10. FRONT COUNTER, STAINLESS STEEL
11. BACK COUNTER, STAINLESS STEEL (BY OWNER / N.I.C.)
12. HAND SINK, WALL MOUNT
13. TRIPLE SINK
14. FREEZER (BY OWNER / N.I.C.)
15. REFRIGERATOR (BY OWNER / N.I.C.)
16. ICE MAKER & ICE BIN (BY OWNER / N.I.C.)
17. FILTER SYSTEM, ICE MAKER (BY OWNER / N.I.C.)
18. WARMER, COUNTERTOP (BY OWNER / N.I.C.)
19. HEAT LAMP FOOD WARMER (BY OWNER / N.I.C.)
20. HOT TOPPING SERVER WITH PUMP (BY OWNER / N.I.C.)
21. MICROWAVE OVEN (BY OWNER / N.I.C.)
22. POPCORN MACHINE (BY OWNER / N.I.C.)
23. DELUXE WARMER (BY OWNER / N.I.C.)
24. ROLLER GRILL (BY OWNER / N.I.C.)
25. EXISTING WALK-IN COOLER RELOCATED FROM EXISTING CONCESSION BUILDING

2 CONCESSION EQUIPMENT PLAN

1/4" = 1'-0"

PLAN NOTE:
1. ALL WALLS ARE M8 TO STRUCTURAL DECK UNLESS OTHERWISE NOTED
2. ALL EXPOSED BURNISHED CMU CORNERS TO BE BULL NOSED



GENERAL NOTE:
ALL WALLS CONTINUE TO STRUCTURE ABOVE ULESS OTHERWISE NOTED.

1 ENLARGED PLAN

1/4" = 1'-0"

PROJECT NORTH

NORTH

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WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019
SHEET TITLE: FLOOR PLANS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

A2-1

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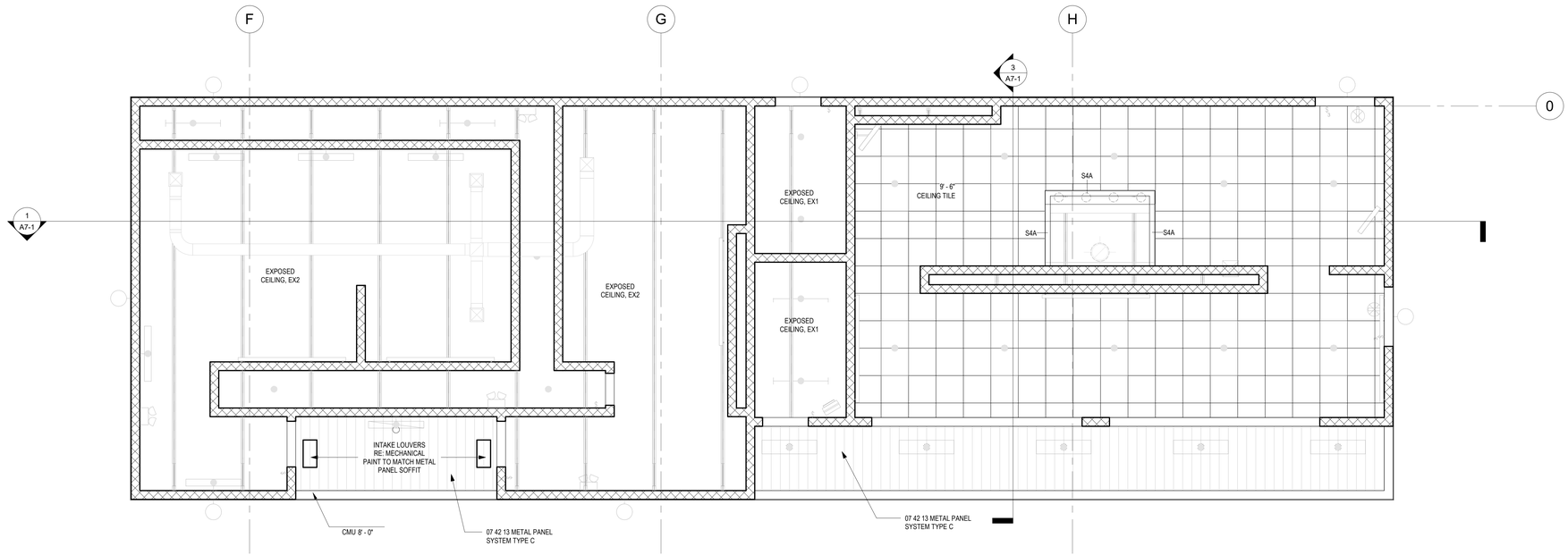
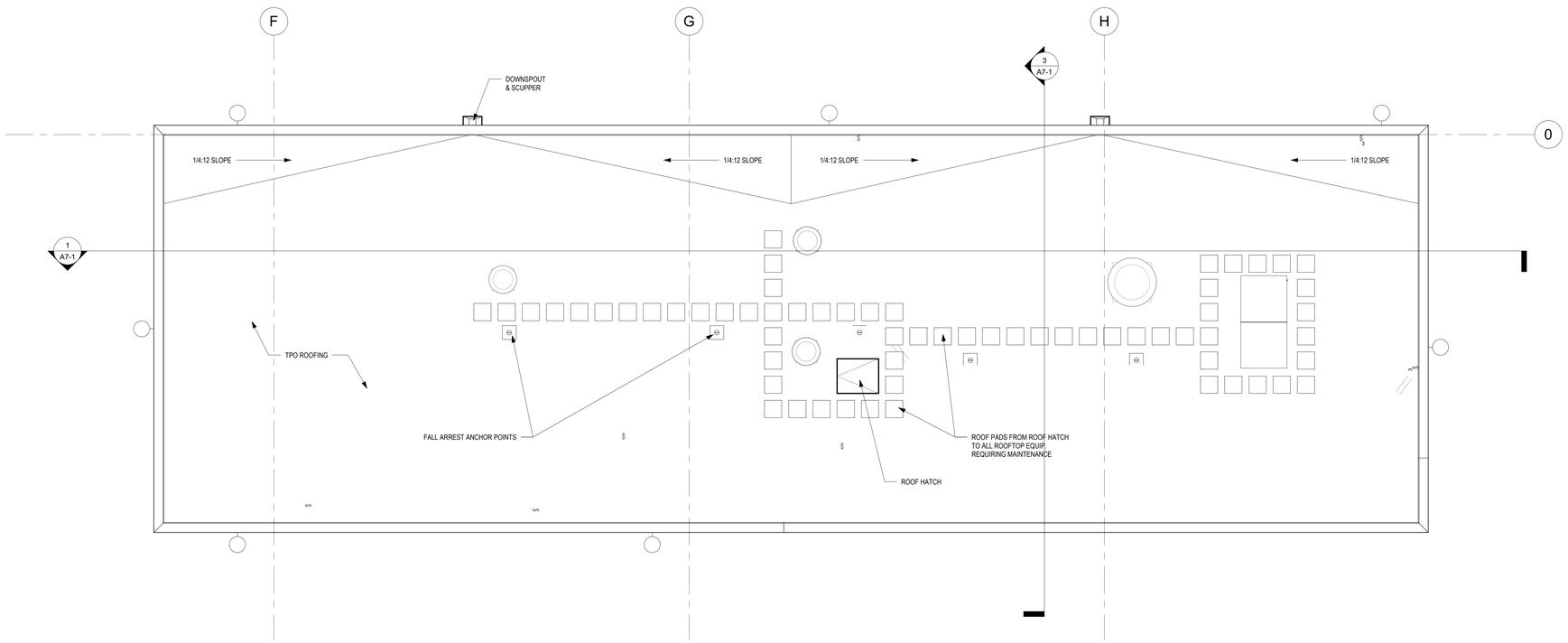


2 EAST CONCESSION REFLECTED CEILING PLAN

1/4" = 1'-0"



1 ENLARGED ROOF PLAN

1/4" = 1'-0"

PROJECT NORTH

NORTH

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WILLIAMSON COUNTY EXPO
EAST CONCESSION & RESTROOM

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CONSTRUCTION
DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019
SHEET TITLE: ROOF PLAN & RCP

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

A2-2

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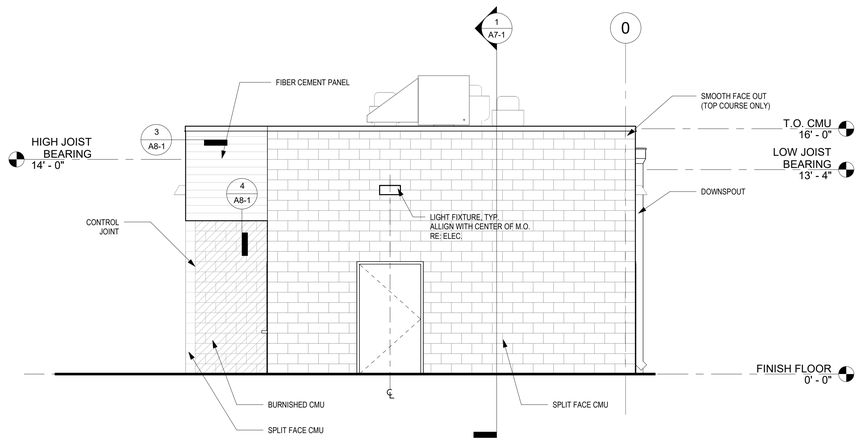
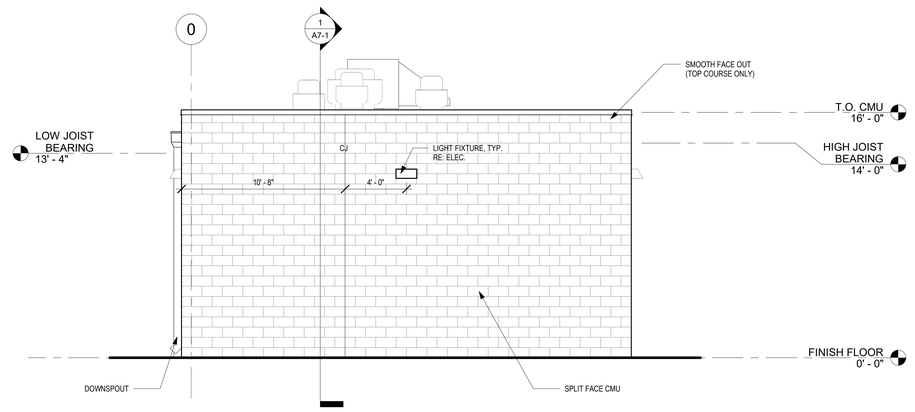
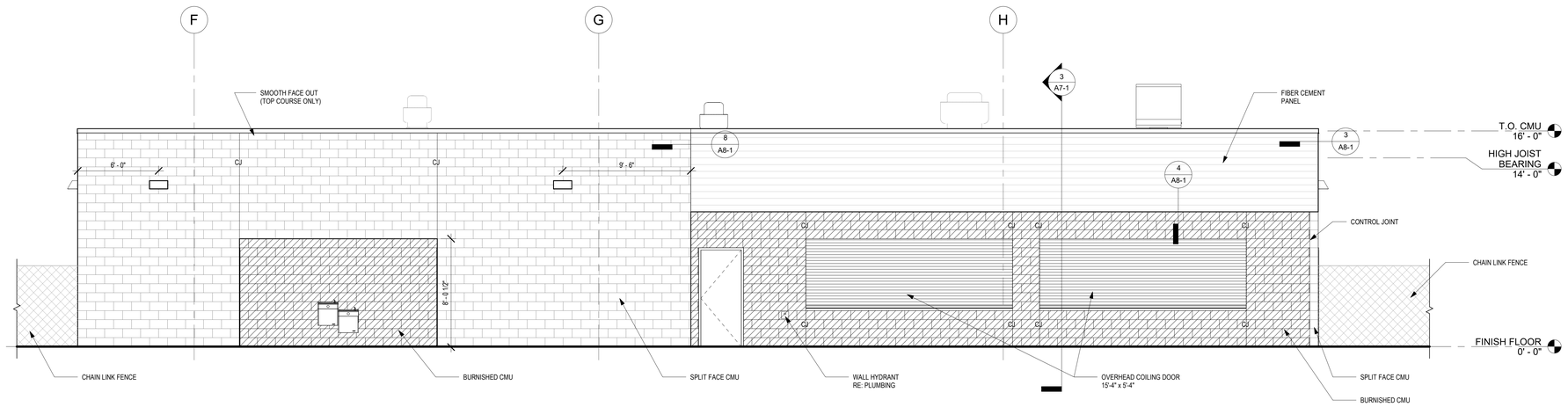


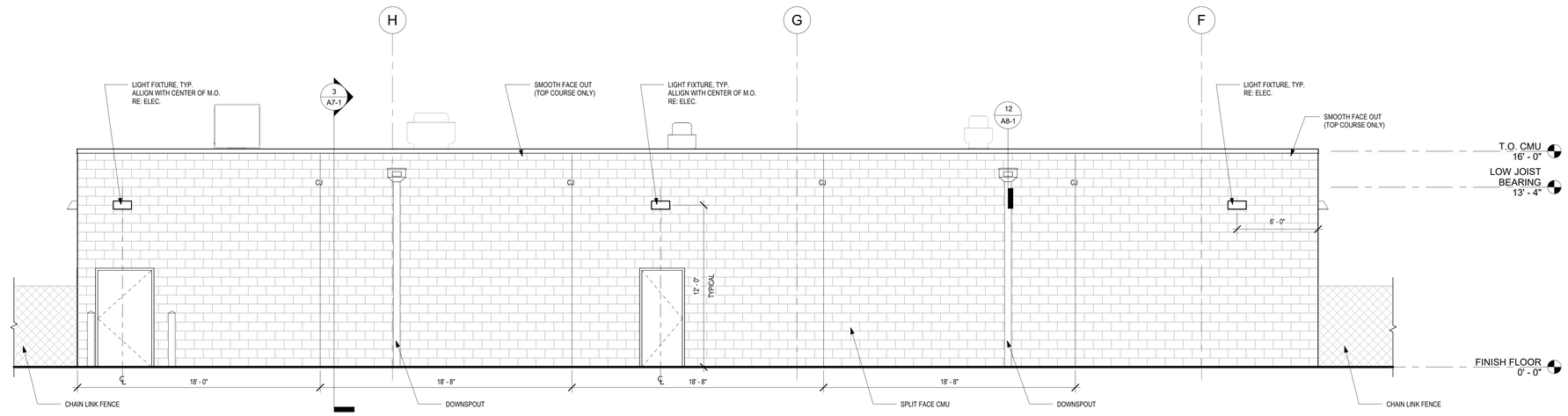
4 SOUTH ELEVATION
1/4" = 1'-0"



3 NORTH ELEVATION
1/4" = 1'-0"



2 WEST ELEVATION
1/4" = 1'-0"



1 EAST ELEVATION
1/4" = 1'-0"

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EAST CONCESSION & RESTROOM

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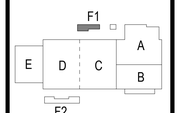
CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
EXTERIOR BUILDING ELEVATIONS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
A5-1

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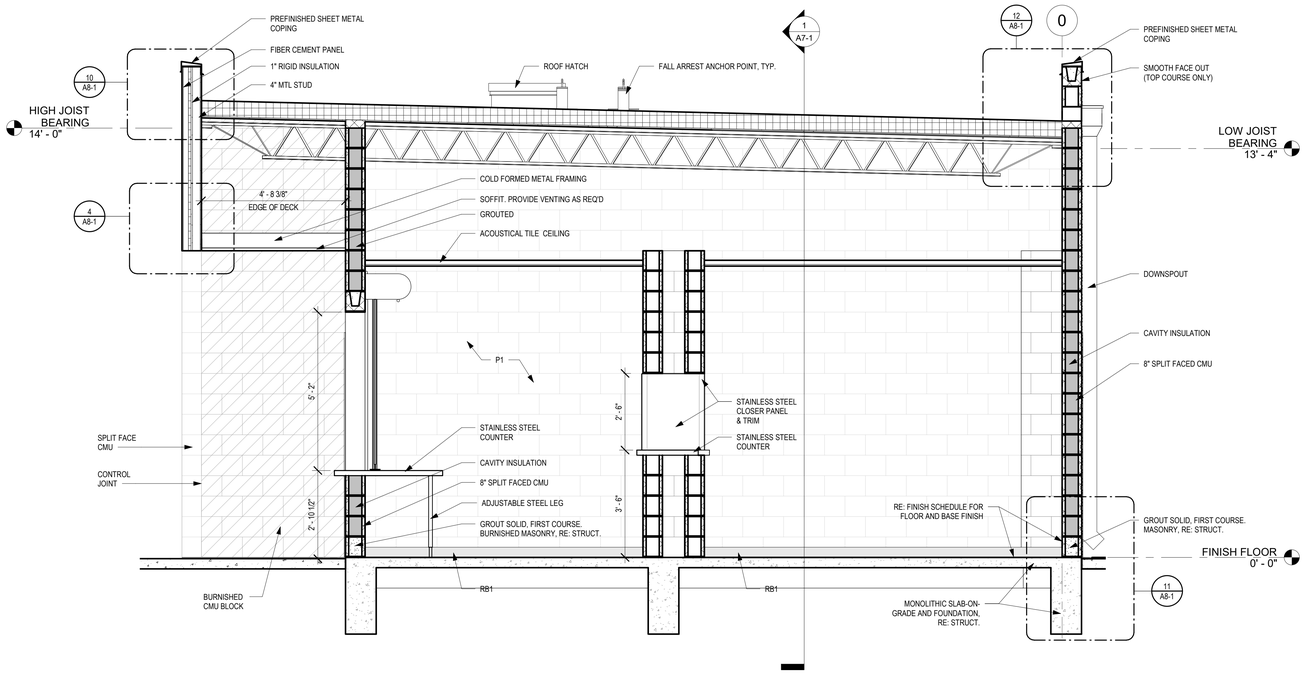
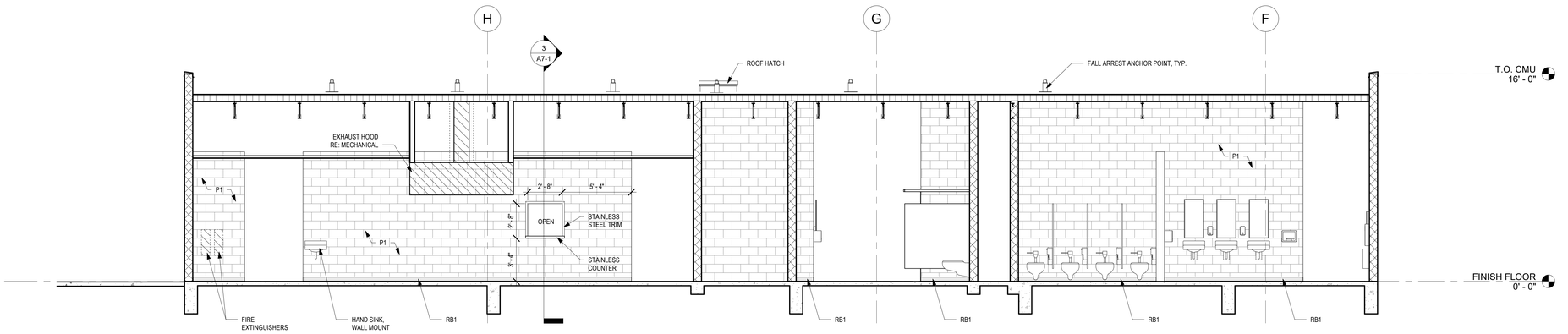


3 TRANSVERSE SECTION

1/2" = 1'-0"



1 LONGITUDINAL SECTION

1/4" = 1'-0"

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
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F2

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
BUILDING SECTIONS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

A7-1

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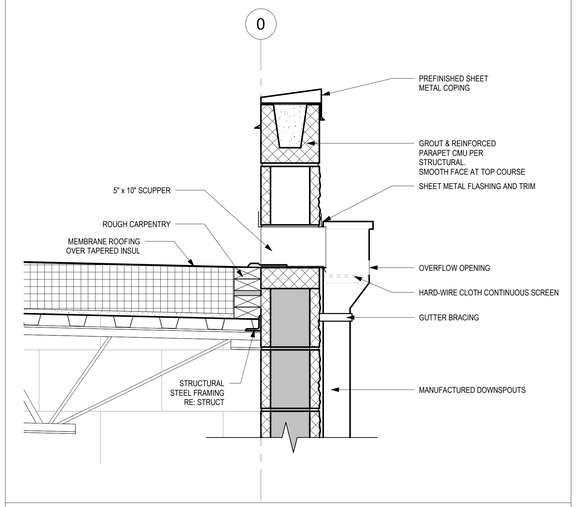
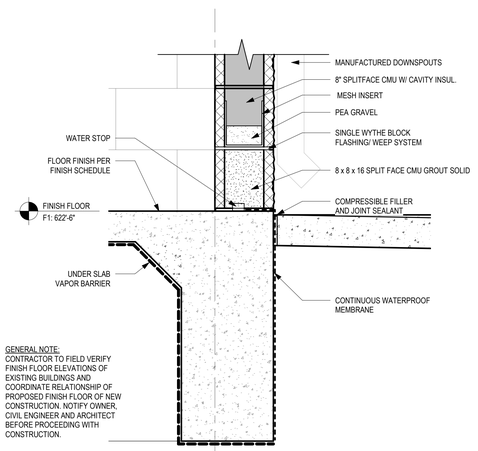


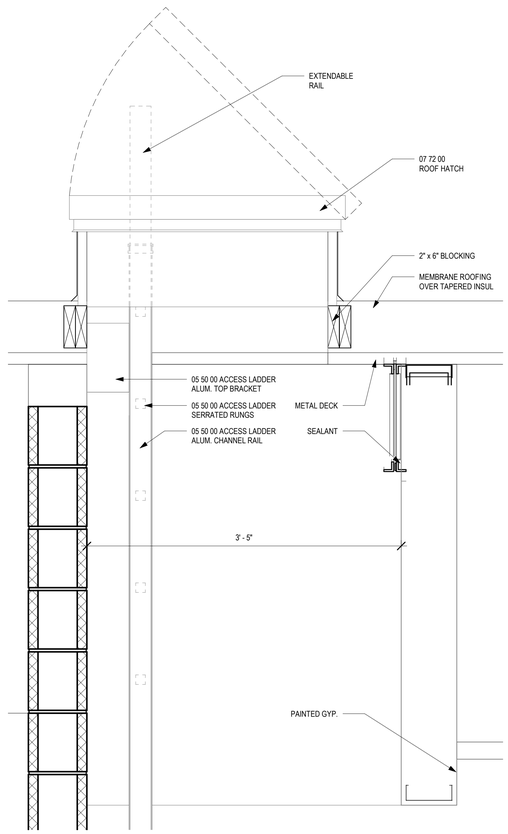
12 SCUPPER DETIAL @ FLAT ROOF

1 1/2" = 1'-0"



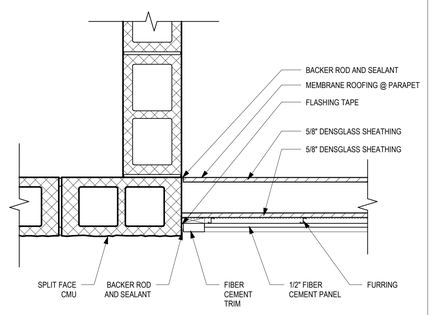
11 CONCESSIONS/ RESTROOM BASE DETAIL

1 1/2" = 1'-0"



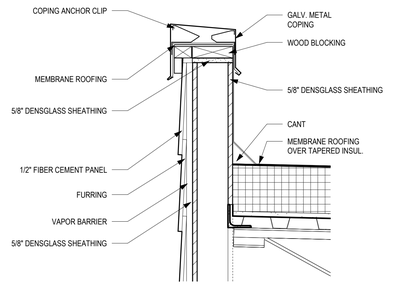
9 ACCESS LADDER ROOF HATCH DETAIL

1 1/2" = 1'-0"



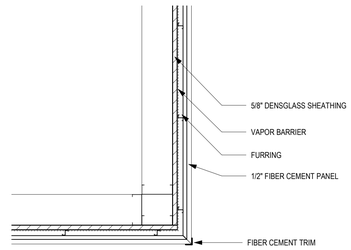
8 FIBER CEMENT PLAN DETAIL

1 1/2" = 1'-0"



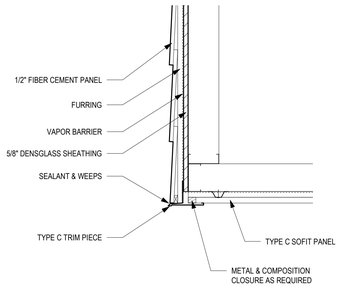
10 FIBER CEMENT PARAPET

1 1/2" = 1'-0"



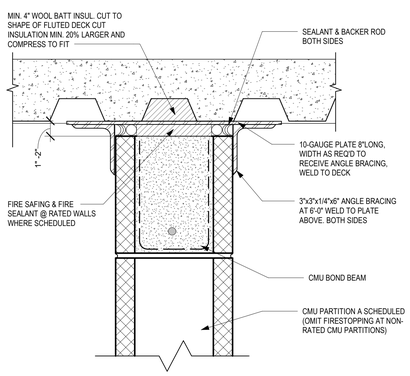
3 FIBER CEMENT CORNER DETAIL

1 1/2" = 1'-0"



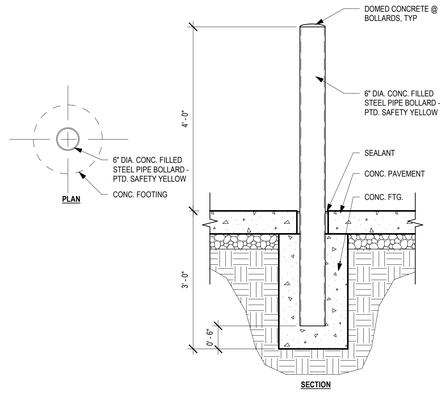
4 FIBER CEMENT & METAL SOFFIT

1 1/2" = 1'-0"



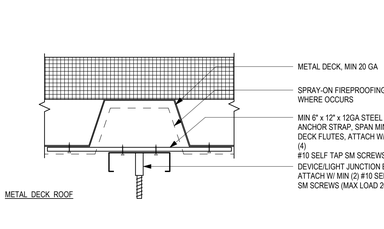
6 T.O. CMU WALL @ STRUCT. ABOVE

3" = 1'-0"



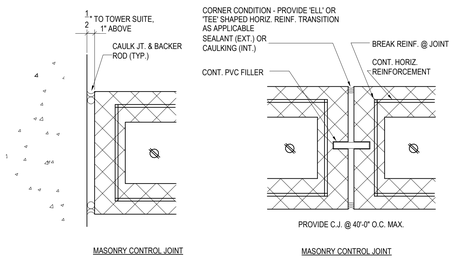
2 BOLLARD DETAIL

3/4" = 1'-0"



5 ELEC DEVICE MTD. @ METAL DECK

3" = 1'-0"



1 TYP. MASONRY JOINT DETAILS

3" = 1'-0"

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WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

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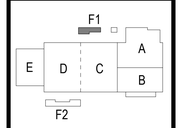
CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019
SHEET TITLE: DETAILS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

A8-1

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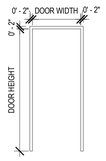
DOOR SCHEDULE

DOOR #	Width	Height	DOOR Type	DOOR Material	FRAME Type	FRAME Material	Fire Rating	DETAILS Head Detail	DETAILS Jamb Detail	HW Set	Comments	FINISH (Int/Ext)
200	3' - 0"	7' - 2"	L	Hollow Metal	1	Hollow Metal				15.0	Exterior	P5
200B	2' - 0"	7' - 2"	F	Hollow Metal	1	Hollow Metal				26.0	-	P1
201A	3' - 0"	7' - 2"	L	Hollow Metal	1	Hollow Metal				15.0	Exterior	P5
202	3' - 0"	7' - 2"	F	Hollow Metal	1	Hollow Metal				9.0	Exterior, Insulated	P5
203	3' - 0"	7' - 2"	F	Hollow Metal	1	Hollow Metal				8.0	Exterior	P5
204A	4' - 0"	7' - 2"	F	Hollow Metal	1	Hollow Metal				16.1	Exterior	P5
204B	15' - 4"	5' - 4"	CR1	Aluminum	Other					21.0	Exterior	Anodized
204C	15' - 4"	5' - 4"	CR1	Aluminum	Other					21.0	Exterior	Anodized
204D	4' - 0"	7' - 2"	F	Hollow Metal	1	Hollow Metal				16.0	Exterior	P5

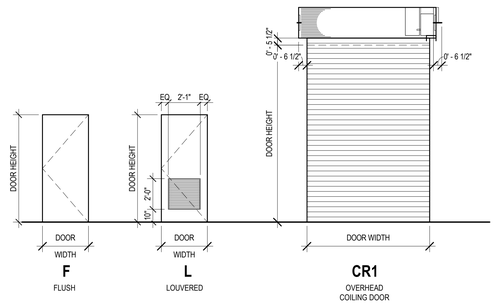
NOTE:
1. ALL GLAZING ADJACENT TO DOORS SHALL BE TEMPERED
2. ALL EXTERIOR DOORS SHALL HAVE WEATHERSTRIPPING AT JAMBS, HEAD AND DOOR BOTTOMS. PROVIDE A THRESHOLD AT ALL EXTERIOR DOORS.
3. FIRE RATED WHERE APPLICABLE.



1
SINGLE DOOR FRAME

8 DOOR FRAME TYPES
1/4" = 1'-0"

NOTE:
GLAZING AT ALL DOORS SHALL BE TEMPERED.



F
FLUSH

L
LOUVERED

CR1
OVERHEAD COILING DOOR

4 DOOR PANEL TYPES
1/4" = 1'-0"

FINISH SCHEDULE

ROOM Number	ROOM Name	Base Finish	Floor Finish	WALLS North	WALLS East	WALLS South	WALLS West	Ceiling Finish	MILLWORK Face	MILLWORK Counter	Remarks	Revision
200	WOMEN'S	RB1	SC1	P1	P1	P1	P1	EX2	-	-	1,2	2
201	MEN'S	RB1	SC1	P1	P1	P1	P1	EX2	-	-	1,2	2
202	ELECTRICAL	-	SC1	-	-	-	-	EX1	-	-		
203	JANITOR	-	SC1	-	-	-	-	EX1	-	-		
204	CONCESSION	RB1	SC1	P1	P1	P1	P1	CL2	-	M1	1,2	2

FINISH LEGEND

CL CEILING SYSTEMS 09 51 13

CL2
Manufacturer: ARMSTRONG
Product: KITCHEN ZONE
Item #673
Color: WHITE
Edge: SQUARE LAY-IN
Size: 2'X2'
Grid: 15/16"
Location: CATERING PREP, CONCESSION
Contact: ELIZABETH MOON, 913.209.9434

EX EXPOSED CEILINGS 07 21 29, 09 91 00

EX1 EXPOSED CEILING STRUCTURE - NO FINISH
Location: REFER TO FINISH SCHEDULE

EX2 PAINT EXPOSED CEILING, STRUCTURE, PLUMBING, MECHANICAL, ETC.
Manufacturer: SHERWIN WILLIAMS
Color: AESTHETIC WHITE 7035
Finish: REFER TO SPECIFICATIONS
Location: REFER TO FINISH SCHEDULE
Contact: BROOK NIENSTEDT, 913.381.8633

M METAL 06 40 00

M1
Product: STAINLESS STEEL
Finish: BRUSHED #4
Location: FOOD SERVICE (CATERING PREP, CONCESSIONS)

P PAINT 09 91 00

P1
Manufacturer: SHERWIN WILLIAMS
Color: AESTHETIC WHITE 7035
Location: PREFUNCTION, GENERAL
Note: SATIN/EGGSHELL FINISH AT GENERAL WALLS; EPOXY PAINT TO BE USED AT FOOD SERVICE LOCATIONS, RESTROOMS

P5
Manufacturer: SHERWIN WILLIAMS
Color: ROOKWOOD RED 2802
Location: METAL DOORS AND DOOR FRAMES, TRELLIS, COLUMNS AT COVERED PENNING, COLUMN COVERS, COPING AT PARAPETS
Note: REFER TO SPECIFICATION FOR PAINT TYPE AND FINISH AT METAL DOORS AND FRAMES.

RB RUBBER BASE 09 65 13

RB1
Manufacturer: JOHNSONITE
Product: RUBBER BASE
Style: TRADITIONAL WALL BASE
Color: 63 BURNT UMBER
Height: 4"
Contact: DIANE DRAKE, 480.455.7382
Note: PROVIDE COORDINATING TRANSITION AND REDUCER STRIPS WHERE MATERIALS TRANSITION TO SEALED OR POLISHED CONCRETE. PROVIDE QUARTER ROUND AT EXPO HALLS ON CMU WALLS.

SC SEALED CONCRETE 09 61 13, 07 19 00

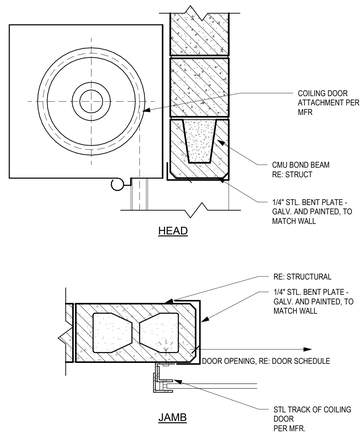
SC1
Product: SEALED CONCRETE W/ DENSIFIER (REFER TO SPECIFICATIONS)
Location: GENERAL

TP TOILET PARTITIONS (SOLID POLYMER TOILET COMPARTMENTS) 10 21 00

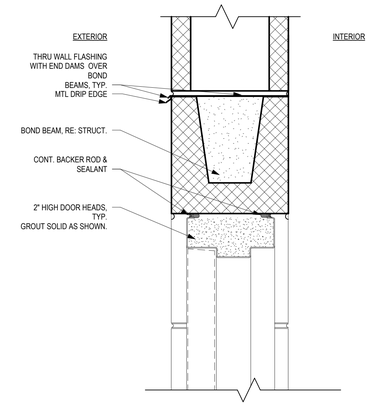
TP1
Manufacturer: ACCURATE PARTITIONS
Product: SOLID PLASTIC (HDPE) TOILET AND URINAL PARTITIONS
Color: ARCHITECT TO SELECT FROM MANUFACTURERS STANDARD OPTIONS
Location: ALL RESTROOM PARTITIONS

GENERAL NOTES
1. STOP ALL PAINT AND FINISHES CHANGES AT INSIDE CORNERS UNLESS OTHERWISE NOTED ON PLANS.
2. ALL EXPOSED DUCTWORK, MECHANICAL UNITS, CONDUIT AND PLUMBING AT EXPOSED CEILINGS SHALL BE FREE OF TAPE, WRITING, OR MARKINGS OF ANY KIND, UNLESS REQUIRED BY CODE OR SPECIFICATIONS, OR IS NECESSARY FOR OPERATION.
3. DO NOT PAINT OVER UL RATED TAGS ON HOLLOW METAL DOORS AND FRAMES.
4. ALL FLOOR FINISHES TRANSITIONING AT DOORWAYS SHALL BE CENTERED ON THE DOOR.
5. PROVIDE ALUMINUM REDUCER TRANSITION PIECE AT FINISHED FLOOR TO SEALED OR STAINED CONCRETE.
6. PAINT ALL MECHANICAL GRILLES, ACCESS PANELS, RECESSED SPEAKERS (IF APPROVED BY MANUFACTURER), AND OTHER MECHANICAL PANELS TO MATCH ADJACENT MATERIAL UNLESS FACTORY FINISHED AND COLOR IS SPECIFIED. CONCEALED SPRINKLER HEADS TO BE PROVIDED WITH FACTORY-APPLIED FINISH TO MATCH ADJACENT MATERIAL, EXCEPT AT AREAS WITH NO CEILING.

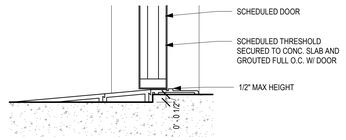
SCHEDULE REMARKS
1. PAINT SHALL BE EPOXY AT ALL WALLS
2. EPOXY BLOCK FILLER AT CMU WALLS
3. ABUSE AND MOLD/MILDEW RESISTANT GYP TO 4'-0"AFF
4. NO BASE AT FULLY TILED WET WALL, CONTINUE WALL TILE TO FLOOR.
5. PRE-PAINTED CONDUIT IN EXPO HALL A & B AT SIMPLE SAVER CEILING.



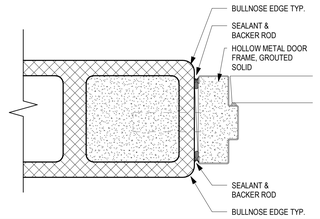
7 HEAD/JAMB DETAIL @ O.H. DOOR
1 1/2" = 1'-0"



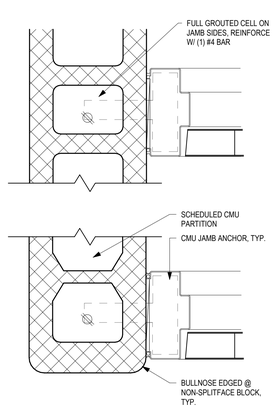
3 8" CMU DOOR HEAD
3" = 1'-0"



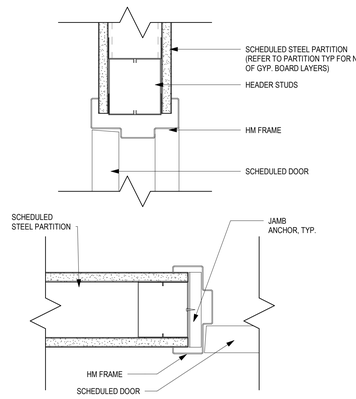
6 THRESHOLD @ H.M. DOOR (EXT.)
3" = 1'-0"



2 JAMB DETAIL @ CMU WALL
3" = 1'-0"



5 JAMB @ H.M. DOOR/FRAME IN CMU
3" = 1'-0"



1 GWB DOOR HEAD/JAMB
3" = 1'-0"

POPULOUS

POPULOUS
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Kansas City, Missouri 64105
816/ 221-1500

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Austin, TX 78729
512-777-4600

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6807 Woodway Drive, Suite 3
Woodway TX, 76712
254-548-3467

WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

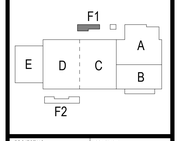
5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION



PROJECT NO. 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019
SHEET TITLE: SCHEDULES & DETAILS
DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
A8-2

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AIR DEVICE SCHEDULE

PDSCH

MARK	NECK SIZE	FRAME SIZE	FRAME TYPE	VOLUME DAMPER	SUPPLY	RETURN	EXHAUST	MODEL	FLEX SIZE	MAXIMUM CFM
D2	14 x 14	16 x 16	SURFACE	●	–	–	●	PRICE MODEL 630DF	–	800
D3	20 x 20	22 x 22	SURFACE	●	–	–	●	PRICE MODEL 630DF	–	1200
F2	20 x 20	22 x 22	SURFACE	–	–	●	●	PRICE MODEL 630FF 2" FILTER FRAME	–	1200

NOTES:

1. COORDINATE EXACT LOCATION OF DIFFUSERS WITH ARCHITECTURAL REFLECTED CEILING PLAN.
2. ALL SUPPLY DIFFUSERS SHALL BE 4-WAY THROW UNLESS NOTED OTHERWISE.
3. ALL FLEX SHALL BE SIZED AS SCHEDULED UNLESS NOTED OTHERWISE.
4. ALL DIFFUSERS SHALL BE WHITE UNLESS NOTED OTHERWISE. COORDINATE EXACT COLOR/FINISH WITH ARCHITECT.
5. VERIFY FRAME TYPE WITH ACTUAL CEILING TYPE PRIOR TO PURCHASE OF AIR DEVICES.
6. ALL VOLUME DAMPERS SHALL BE OPPOSED BLADE TYPE.
7. RUN-OUTS AND DROPS FROM R/A MAIN TRUNKS SHALL BE AS FOLLOWS: UP TO 250 CFM USE 10" DIAMETER OR 10" x 8"; 251 CFM TO 450 CFM USE 12" DIAMETER OR 12" x 10"; 451 CFM TO 700 CFM USE 14" DIAMETER OR 12" x 12"; 701 CFM TO 1000 CFM USE 16" DIAMETER OR 14" x 16"; 1001 CFM TO 1400 CFM USE 18" DIAMETER OR 16" x 18", UNLESS SHOWN OTHERWISE.
8. INSULATE BACKS OF ALL AIR DEVICES.
9. PROVIDE PRICE PLASTER FRAME FOR ALL AIR DEVICES LOCATED IN GYP OR PLASTER CEILINGS.
10. AIR DEVICES LOCATED IN DAMP AREAS (SHOWERS/LOCKER ROOMS/TRAINING ROOMS) ARE TO BE OF THE SAME SIZE AND TYPE AS SHOWN ON THE AIR DEVICE SCHEDULE BUT MUST BE OF ALL ALUMINUM CONSTRUCTION. ALL DEVICES SCHEDULED TO BE ALUMINUM MUST BE ALUMINUM NO MATTER WHERE THEY ARE LOCATED.
11. TRANSITION TO AIR DEVICE NECK SIZE AS REQUIRED.
12. ALL LAY-IN AIR DEVICES ARE TO BE CONNECTED WITH FLEX DUCT. PROVIDE WITH MINIMUM 3" HIGH ROUND NECK OR SQUARE TO ROUND ADAPTER WITH 3" HIGH NECK FOR PROPER CONNECTION OF FLEX DUCT (SIZED PER SCHEDULE) TO AIR DEVICE.

∗ PROVIDE INACTIVE SECTIONS OF LINEAR SLOTS WITH BLANK-OFF PLATES.
∗ PROVIDE ALL ACCESSORIES REQUIRED FOR A COMPLETE CONTINUOUS APPEARANCE.

FAN SCHEDULE

EFSCH

MARK NO.	GREENHECK MODEL NO.	CFM	S.P.	RPM	DRIVE	H.P.	VOLT/PH	WATTS OR AMPS	ACCESSORIES
CONCESSION									
EF-1F1	CUE-099-VG	400	.25	884	DIRECT	1/4	120/1	5.8 A	16
EF-2F1	CUE-060-VG	100	.25	1433	DIRECT	1/6	120/1	4.4 A	12
EF-3F1	CUE-180-VG	1425/2850	.375	886	DIRECT	1	120/1	16 A	12, 24
KEF-1F1	REFERENCE SHEETS M1-3, M1-4 AND M1-5 FOR GREASE HOOD AND ASSOCIATED FAN INFO								1
KSF-1F1	REFERENCE SHEETS M1-3, M1-4 AND M1-5 FOR GREASE HOOD AND ASSOCIATED FAN INFO								2

STANDARD NOTES - APPLIES TO ALL FANS

A. BALANCE ALL FANS TO ACTUAL CFM SHOWN ON FLOOR PLANS.
B. BIRD SCREEN.
C. FANS INSTALLED ON METAL STANDING SEAM ROOFS: ROOF CURB IS TO BE FURNISHED, INSTALLED, FLASHED AND COUNTER FLASHED BY ROOFING CONTRACTOR. MECHANICAL CONTRACTOR IS TO COORDINATE SIZE AND LOCATION. CURB IS TO EXTEND A MINIMUM OF 12" ABOVE FINISHED ROOF ON SHORT SIDE.
D. FANS INSTALLED ON BUILT-UP ROOF: ROOF CURB IS TO BE FLASHED AND COUNTER FLASHED BY ROOFING CONTRACTOR. MECHANICAL CONTRACTOR IS TO FURNISH AND INSTALL ROOF CURB AND COORDINATE LOCATION. CURB IS TO EXTEND A MINIMUM OF 12" ABOVE FINISHED ROOF ON SHORT SIDE.
E. FACTORY DISCONNECT.
F. PROVIDE EACH ROOF MOUNTED FAN WITH OPPOSED BLADE DAMPER WITH HEAVY DUTY MOTORIZED ACTUATOR (MATCH FAN VOLTAGE) UNLESS SPECIFICALLY NOTED OTHERWISE. ELECTRICAL CONTRACTOR TO TIE DAMPER ACTUATOR IN TO FAN POWER.
G. UNIT WEIGHT LESS THAN 100 LBS. UNLESS NOTED OTHERWISE.
H. COORDINATE ALL FINAL FAN LOCATIONS AND FRAMING WITH STRUCTURAL.
I. ALL ALTERNATE MANUFACTURER'S FANS MUST OPERATE WITH CFM, RPM AND HP RANGE AS FANS LISTED ABOVE TO ALLOW FLEXIBILITY. FANS MAY NOT BE DOWN SIZED.
J. FAN SPEED CONTROL (MOUNTED UNDER DOME ON ROOF FANS OR NEXT TO CABINET FANS FOR ALL DIRECT DRIVE FANS).
K. DUCT DROPS ARE TO BE FULL SIZE OF DAMPER OR SIZED AT .08" SP WHICHEVER IS GREATER OR AS SPECIFICALLY NOTED.
L. POWDER COATED METAL IS NOT ALLOWED TO BE USED IN LIEU OF GALVANIZED UNLESS SPECIFICALLY SCHEDULED.

ACCESSORIES AND NOTES

1. UPBLAST GREASE FAN ACCESSORIES: FAN TO BE UL AND cUL LISTED FOR GREASE REMOVAL, HEAT BAFFLE, BIRD GUARD, HINGE KIT, DRAIN CONNECTION, GREASE TRAP AND VENTED CURB EXTENSION (MUST MEET THE NFPA 96 REQUIREMENT FOR A 40" DISCHARGE HEIGHT), PROVIDE WITH SEPARATE CURB FROM ANY SUPPLY FAN.
2. KITCHEN SUPPLY FAN ARRANGEMENT "DB" ACCESSORIES: EXHAUST FAN AND SUPPLY FAN TO BE MOUNTED ON **SEPARATE** CURBS AND PROVIDE MOPPED IN EQUIPMENT SUPPORT RAIL WITH GALVANIZED UNISTRUT SUPPORT FOR WEATHER HOOD, MOTORIZED INTAKE DAMPER, SPACER SECTION (TO MAINTAIN 10 FEET SEPARATION FROM EXHAUST FAN), FILTER SECTION THAT ACCOMMODATES 2" FILTERS, WEATHER HOOD, SUPPLY FAN INTERLOCKED TO RUN WITH KITCHEN EXHAUST FAN. KITCHEN EXHAUST FAN IS TO RUN AND SUPPLY FAN IS TO GO OFF IN THE EVENT THAT A FIRE IS DETECTED. FURNISH WITH REMOTE OR FAN CASING MOUNT PREWIRED KITCHEN FAN CONTROL CENTER WITH STARTERS, DISCONNECTS, CONTROL TRANSFORMERS, AND SINGLE POINT ELECTRICAL CONNECTION. ELECTRICAL CONTRACTOR TO MAKE ALL CONTROL AND LINE VOLTAGE TERMINATIONS AND FEED THROUGH CONNECTIONS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM. 120 VOLT CONTROL VOLTAGE FOR HOOD FAN PACKAGE IS TO BE OBTAINED FROM HOOD LIGHTING CIRCUIT.
3. DIRECT FIRED GAS HEAT.
4. ELECTRIC HEAT.
5. PERFORATED BAFFLE INSTALLED AT INLET.
6. GRAVITY BACK DRAFT DAMPER.
7. RADIATION DAMPER (CEILING MOUNTED FANS).
8. COMBINATION NEOPRENE / SPRING VIBRATION ISOLATION.
9. INLET GUARD.
10. BELT GUARD.
11. MAGNETIC MOTOR STARTER.
12. SWITCHED WITH LIGHTS BY ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR TO PROVIDE ALL RELAYS AND APPURTENANCES.
13. SWITCHED BY SPRING WOUND TIMER (1 HR MAX) PROVIDED BY ELECTRICAL CONTRACTOR. LOCATE NEXT TO ROOM LIGHT SWITCH UNLESS OTHERWISE NOTED.
14. SWITCHED BY WALL SWITCH WITH PILOT LIGHT BY ELECTRICAL CONTRACTOR. LOCATE NEXT TO ROOM LIGHT SWITCH UNLESS OTHERWISE NOTED.
15. SWITCHED BY HOOD MOUNTED SWITCH WITH PILOT LIGHT BY ELECTRICAL CONTRACTOR.
16. SWITCHED BY THERMOSTAT. THERMOSTAT PROVIDED BY MECHANICAL CONTRACTOR. INSTALLED BY ELECTRICAL CONTRACTOR.
17. CONTROLLED BY ENERGY MANAGEMENT SYSTEM.
18. 120V/1PH MOTORIZED DAMPER FOR INLINE FAN TIED IN TO FAN POWER.
19. EXPLOSION PROOF FAN. WIRE TO RUN CONTINUOUSLY
20. PERFORATED BAFFLE INSTALLED AT INLET.
21. INTERLOCKED WITH DISHWASHER.
22. DRYER BOOSTER FAN. PROVIDE ALL CONTROLS AND INTERLOCKING WIRING REQUIRED FOR A COMPLETE OPERABLE SYSTEM.
23. SIDEWALL PROPELLER FAN PROVIDE WITH HOUSING, MOTORIZED BACKDRAFT DAMPER, INTEGRAL DISCONNECT, MOTOR SIDE GUARD AND TRANSITIONS AS REQUIRED TO CONNECT TO WALL LOUVER.
24. TWO SPEED FAN, PROVIDE FAN SPEED CONTROLLER TO ALLOW FOR TWO SPEED FAN OPERATION. INSTALL SPEED CONTROLLER IN AN ACCESSIBLE LOCATION AS DETERMINED BY ARCHITECT AND OWNER (CURRENTLY SHOWN IN JANITOR 203). PROVIDE AN ENGRAVED LABEL EXPLAINING OPERATING PROCEDURE. HIGH SPEED FOR SUMMER TIME OPERATION, LOW SPEED FOR WINTER TIME OPERATION. CFM'S LISTED ARE FOR LOW SPEED OPERATION. DOUBLE THE CFM FOR HIGH SPEED OPERATION. TEST AND BALANCE REPORTS TO INDICATE BOTH SETTINGS.

GENERAL NOTES

A. THE CONTRACTOR IS TO VISIT THE SITE PRIOR TO BID TO FAMILIARIZE HIMSELF WITH ALL CONDITIONS AS THEY EXIST. SUBMISSION OF BID INDICATES THE CONTRACTOR'S UNDERSTANDING OF EXISTING CONDITIONS AND HIS WILLINGNESS TO WORK WITH THESE CONDITIONS. NO ADDITIONAL TIME OR MONEY WILL BE ALLOTTED DUE TO LACK OF COORDINATION WITH EXISTING CONDITIONS OR OTHER TRADES.

B. CONTRACTORS TO REVIEW AND COMPARE ALL DRAWINGS SO ALL WORK IN THEIR RESPECTIVE TRADE IS INCLUDED IN BID. EACH CONTRACTOR SHALL INCLUDE ALL MATERIALS AND INSTALLATION REQUIRED FOR HIS PARTICULAR TRADE AFTER COMPLETE REVIEW OF ALL CONTRACT DRAWINGS AND SPECIFICATIONS.

C. ALL WORK SHALL COMPLY WITH THE CURRENT APPLICABLE LOCAL, STATE AND FEDERAL CODES AND ORDINANCES. FOLLOW RECOMMENDED PRACTICES AS SET DOWN BY ASME, SMACNA, ASHRAE, NFPA, APPLICABLE BUILDING CODE, APPLICABLE MECHANICAL CODE, APPLICABLE PLUMBING CODE, NATIONAL ELECTRICAL CODE, AGA, ADA AND OSHA, AS THEY APPLY TO THIS PROJECT, EXCEPT IN CASES WHERE LOCAL STATUTES GOVERN. THE CONTRACTOR SHALL VERIFY WITH THE LATEST ADOPTED LOCAL CODES, ORDINANCES AND AMENDMENTS THAT APPLY TO THIS PROJECT WITH THE AUTHORITY HAVING JURISDICTION.

D. MECHANICAL CONTRACTOR TO COMPLETE A MECHANICAL/ELECTRICAL EQUIPMENT COORDINATION SHEET IN SPECIFICATION SECTION 20 00 00 AND SUBMIT COMPLETED FORM WITH EQUIPMENT SUBMITTAL AND PROVIDE A COMPLETED FORM TO THE ELECTRICAL CONTRACTOR.

E. TRANSITION FROM DUCT SIZE SHOWN TO ROOF OPENING SIZE FOR EXHAUST FANS AND OTHER ROOF MOUNTED EQUIPMENT. ALLOW FOR CLEARANCE BETWEEN STRUCTURAL JOISTS.

F. PROVIDE COMPLETE DIRECT DIGITAL CONTROL SYSTEM DESIGNED TO MEET THE JOB SPECIFICATIONS. UNLESS THE DIRECT DIGITAL CONTROL SPECIFICATIONS SPECIFICALLY CALL FOR A HYBRID SYSTEM UTILIZING STANDARD THERMOSTATS, DEHUMIDISTATS, ETC. ALL CONTROLS REQUIRED ARE TO BE PROVIDED BY THE CONTROLS CONTRACTOR. PRIOR TO SUBMISSION OF BIDS, CONTROL CONTRACTOR IS SOLELY RESPONSIBLE FOR VERIFICATION OF CONTROL REQUIREMENTS FOR ALL HVAC GEAR WITH MANUFACTURER. VERIFY ACTUAL NUMBER OF POINTS REQUIRED AND PROVIDE APPROPRIATE CONTROLLERS WITH A SUFFICIENT NUMBER OF POINTS AVAILABLE. PULSE WIDTH MODULATORS OR ANY OTHER METHOD OF STRETCHING A GIVEN CONTROLLERS NUMBER OF POINTS ARE STRICTLY PROHIBITED. ADDITIONAL MONIES NOT WILL BE ALLOTTED DUE TO FAILURE OF BIDDER TO VERIFY ALL REQUIREMENTS PRIOR TO SUBMISSION OF BIDS.

G. CONFIRM LOCATION AND MOUNTING HEIGHT OF EACH THERMOSTAT/SENSOR PRIOR TO INSTALLATION. COORDINATE WITH ARCHITECT, OWNER, MILLWORK, SWITCHES, EQUIPMENT, FURNITURE, ETC. PROVIDE INSULATED SUBBASE FOR EACH THERMOSTAT/SENSOR.

H. PROVIDE ENGRAVED LABELS FOR ALL EQUIPMENT. LABEL ALL THERMOSTATS/SENSORS TO CORRESPONDING EQUIPMENT NUMBER. PROVIDE ENGRAVED ACCESS PANEL MARKERS ON THE CEILING GRID TO INDICATE ACCESS LOCATIONS FOR EQUIPMENT ABOVE CEILING.

I. COORDINATE FRAMED OPENING THROUGH ROOF FOR EQUIPMENT. VERIFY SIZE AND METHOD WITH STRUCTURAL ENGINEER. PROVIDE ROOF SHOP DRAWING INDICATING SIZE AND LOCATION OF ROOF OPENINGS FOR COORDINATION PURPOSES.

J. COORDINATE PLACEMENT AND SUPPORT OF ALL ROOF MOUNTED EQUIPMENT CURBS AND SUPPORTS WITH STRUCTURAL PRIOR TO INSTALLATION.

K. RETURN AIR PLENUMS ON BACK OF AIR HANDLING UNITS TO BE FULL SIZE OF RETURN OPENING ON UNITS. PROVIDE MINIMUM 16" x 16" ACCESS DOOR IN RETURN PLENUM IN ACCESSIBLE LOCATION.

L. WHERE STRUCTURAL BRIDGING IS REMOVED, RE-BRIDGE ON EACH SIDE OF JOIST. VERIFY WITH STRUCTURAL ENGINEER PRIOR TO REMOVING ANY BRIDGING.

M. COORDINATE WITH ALL STRUCTURAL BRACING FOR ROUTING OF DUCT AND DIFFUSERS.

N. BEFORE ANY CUTTING OR TRENCHING OPERATIONS BEGIN, VERIFY WITH OWNER'S REPRESENTATIVE, UTILITY COMPANIES AND OTHER INTERESTED PARTIES THAT ALL AVAILABLE INFORMATION HAS BEEN PROVIDED CONCERNING EXISTING UTILITY LOCATION. VERIFY LOCATIONS GIVEN. CONTACT ARCHITECT IMMEDIATELY UPON UNCOVERING UNKNOWN UTILITIES FOR FURTHER DIRECTION. INDICATE ALL UNCOVERED UTILITIES ON RECORD DRAWINGS.

O. COORDINATE LOCATION AND MOUNTING TYPE OF ALL CEILING AIR DEVICES IN ACCORDANCE WITH ARCHITECTURAL REFLECTED CEILING PLANS.

P. ROOFTOP MOUNTED EQUIPMENT TO BE PROVIDED WITH FACTORY FULL PERIMETER SLOPED CURBS TO MATCH ROOF FOR EACH UNIT. ALL OTHER ROOF MOUNTED EQUIPMENT REQUIRING A CURB LESS THAN 30" IN ANY DIMENSION TO BE PROVIDED WITH FULL PERIMETER CURB. ALL CURBS AND ROOF SUPPORTS TO ALLOW FOR ROOF SLOPE SO EQUIPMENT WILL SIT LEVEL. TOP OF CURB TO BE A MINIMUM OF 12" ABOVE FINISHED ROOF ON SHORT SIDE OR 8" ABOVE TOP OF CRICKET IF APPLICABLE.

Q. INSTALL CLEAN SET OF FILTERS THROUGHOUT AT COMPLETION OF PROJECT. ANY UNITS THAT ARE OPERATED DURING CONSTRUCTION SHALL HAVE FILTER MEDIA (FIBERBOND DUAL-PLY DUSTLOK MEDIA) PLACED OVER THE EXTERIOR OF RETURN AIR GRILLES. MEDIA SHALL BE CHANGED AS FREQUENTLY AS REQUIRED TO KEEP DUCTWORK CLEAN. WHEN RETURN AIR FILTERS ARE LOCATED AT UNIT, PROVIDE INSULATED FILTER RACK SUITABLE FOR 2" THICK, FACTORY STANDARD FILTER SIZES, THAT IS AIRTIGHT WITH HINGED ACCESS DOOR AND LATCH, UNLESS SUCH A RACK IS INTEGRAL TO UNIT CONSTRUCTION.

R. PROVIDE ALL APPROPRIATE TOOLS, WRENCHES, KEYS, ETC. AS REQUIRED FOR ACCESS AND OPERATION OF VALVES, COVERS, ETC.

S. SEAL AROUND ALL DUCTWORK AND PIPING AT PENETRATIONS THROUGH SOUND WALLS WITH ACOUSTICAL SEALANT.

T. ALL ACCESS DOORS SHALL BE INSTALLED IN EASILY ACCESSIBLE LOCATIONS. RELOCATE ANY ACCESS DOOR THAT IS NOT INSTALLED IN THIS MANNER. THIS SHALL BE DONE AT NO ADDITIONAL COST TO OWNER. INSTALL MINIMUM 12" x 12" HINGED ACCESS DOORS WITH CAM LOCKS AT THE END OF ALL DUCT RUNS, AT 20' INTERVALS ALONG LENGTH OF RUN, AND ON EACH SIDE OF ELBOWS WITH TURNING VANES. REFERENCE SPECIFICATIONS FOR MORE INFORMATION.

BB. COORDINATE LOCATION OF DUCTWORK WITH LOCATION AND DEPTH OF ALL LIGHT FIXTURES PRIOR TO INSTALLATION.

CC. MECHANICAL CONTRACTOR TO HAVE STAMPED AND REVIEWED DUCT SHOP DRAWINGS PRIOR TO INSTALLATION OF ANY DUCTWORK IN FIELD.

DD. ABSOLUTELY NO PIPING OR DUCTWORK CAN BE ROUTED ABOVE ELECTRICAL PANELS, GEAR OR TRANSFORMERS. THE ONLY HVAC, PLUMBING, SPRINKLER PIPING OR DUCTWORK THAT CAN ENTER AN ELECTRIC ROOM ARE THOSE SPECIFICALLY SERVING THAT ROOM. THESE SERVICES CAN ONLY ENTER INTO ELECTRIC ROOM ABOVE ENTRY DOOR.

FF. ALL ROOF MOUNTED MECHANICAL EQUIPMENT MUST BE LOCATED A MINIMUM OF 10' AWAY FROM THE EDGE OF THE ROOF OR A CHANGE IN ROOF ELEVATION THAT IS GREATER THAN 30". PER OSHA REQUIREMENTS, IF ROOF MOUNTED EQUIPMENT MUST BE LOCATED CLOSER TO THE EDGE OF THE ROOF THAN 10', THERE MUST BE A PARAPET THAT IS A MINIMUM OF 42" TALL OR PROVIDE AN OSHA APPROVED SAFETY RAIL. REFERENCE THE LATEST OSHA REGULATIONS FOR MORE INFORMATION AND PROVIDE LATEST REQUIREMENTS.

GG. SEAL AROUND ALL DUCTWORK AND PIPING AT PENETRATIONS THROUGH RATED WALLS WITH FIRE SEALANT. ALL PENETRATIONS THROUGH RATED WALLS ARE TO BE SEALED ACCORDING TO THE FIRE SEALANT MANUFACTURER'S INSTALLATION INSTRUCTIONS. SUBMIT ON U.L. SYSTEM TO BE USED FOR EACH TYPE OF PENETRATION, POST A COPY OF INSTALLATION INSTRUCTIONS AT JOB SITE ACCESSIBLE TO ALL WORKERS PERFORMING WORK.

HH. ALL OPENINGS OF DUCTWORK AND MECHANICAL EQUIPMENT MUST BE COVERED WITH PLASTIC AND TIGHTLY SEALED TO PREVENT DUST AND CONSTRUCTION DEBRIS FROM ENTERING SYSTEMS, THIS INCLUDES EQUIPMENT AND DUCTWORK STORED ON SITE. IF THE MECHANICAL EQUIPMENT IS OPERATED PRIOR TO ACCEPTANCE OF THE BUILDING BY OWNER, ALL OUTLET AND INLETS OF THE SYSTEM MUST BE PROTECTED WITH ROLLED FILTER MEDIA EQUAL TO (FIBERBOND DUAL-PLY DUSTLOC MEDIA). UNITS MUST BE SHUT DOWN WHEN PAINTING, SANDING AND SIMILAR CONSTRUCTION OPERATIONS ARE BEING PERFORMED. SYSTEMS THAT ARE OPERATED DURING CONSTRUCTION MUST BE CLEANED TO NEW CONDITION BEFORE FINAL PAYMENT WILL BE APPROVED. ITEMS TO BE CLEANED INCLUDE: WHOLE DUCT SYSTEM, AIR DEVICES, BLOWERS, MOTORS, UNIT CASING, EVAPORATOR COILS, CONDENSER COILS AND ALL OTHER COMPONENT EFFECTED BY THE OPERATION OF THE SYSTEMS.

JJ. ALL SUPPLY BRANCH DUCTS ARE TO HAVE BALANCING DAMPERS WITH MANUAL LOCKING QUADRANT OPERATORS. PROVIDE STAND-OFF BRACKETS EQUIVALENT TO INSULATION THICKNESS.PROVIDE BALANCING DAMPERS IN OTHER DUCT SYSTEMS AS REQUIRED TO PROPERLY BALANCE SYSTEMS. SINGLE BLADE DAMPERS ARE ACCEPTABLE IN DUCTS 14" ROUND OR 14" TALL, LARGER DUCTS TO HAVE MULTIPLE BLADE DAMPERS. ALL DAMPER BLADES AND HARDWARE ARE TO BE FABRICATED OF SUFFICIENT GAGE AND HAVE REINFORCEMENTS AS REQUIRED TO PREVENT VIBRATION.

M/P ABBREVIATION SCHEDULE

AD	ACCESS DOOR	MAINT	MAINTENANCE
ABV	ABOVE	MAU	MAKEUP AIR UNIT
AFF	ABOVE FINISHED FLOOR	MAX	MAXIMUM
ARCH	ARCHITECT	MC	MECHANICAL CONTRACTOR
AUTO	AUTOMATIC	MBH	1000 BTU PER HOUR
AUX	AUXILIARY	MECH	MECHANICAL
AHU	AIR HANDLING UNIT	MH	MANHOLE
		MIN	MINIMUM
BD	BALANCE DAMPER	MISC	MISCELLANEOUS
BFF	BELOW FINISHED FLOOR	MTD	MOUNTED
BLDG	BUILDING	MOD	MOTOR OPERATED DAMPER
BOD	BOTTOM OF DUCT		
BOP	BOTTOM OF PIPE	NIC	NOT IN CONTRACT
BF	BOOSTER FAN	N.O.	NORMALLY OPEN
		N.C.	NORMALLY CLOSED
CLG	CEILING	NO.	NUMBER
CLR	CLEAR/CLEARANCE	NTS	NOT TO SCALE
CO	CLEANOUT		
COL	COLUMN	O/A	OUTDOOR AIR
CONC	CONCRETE	OBD	OPPOSED BLADE DAMPER
CONTR	CONTRACTOR	OC	ON CENTER(S)
CW	COLD WATER	OPNG	OPENING
CONN	CONNECTION	ORL	OVERFLOW RAINLEADER
CU	CONDENSING UNIT	OAH	OUTSIDE AIR HOOD
Cu	COPPER		
CHS	CHILLED WATER SUPPLY	PC	PLUMBING CONTRACTOR
CHR	CHILLED WATER RETURN	PH	PHASE
		PLBG	PLUMBING
DIA	DIAMETER		
DN	DOWN	R/A	RETURN AIR
DWG	DRAWING	RE:	REFERENCE/REFER TO
DH	DUCT HEATER	REFRIG	REFRIGERANT
E/A	EXHAUST AIR	REF	REFRIGERATOR
EC	ELECTRICAL CONTRACTOR	REQD	REQUIRED
EF	EXHAUST FAN	RHP	RADIANT HEAT PANEL
ELEC	ELECTRIC/ELECTRICAL	RL	RAINLEADER
EQ	EQUAL	RM	ROOM
EQUIP	EQUIPMENT	RTU	ROOFTOP UNIT
EX	EXISTING		
EXH	EXHAUST	S/A	SUPPLY AIR
E.S.P.	EXTERNAL STATIC PRESSURE	SCH	SCHEDULE
ERV	ENERGY RECOVERY VENTILATOR	SP	STATIC PRESSURE
		SPEC	SPECIFICATION
FCO	FLOOR CLEAN OUT	SD	STORM DRAIN
FCU	FAN COIL UNIT	SF	SUPPLY FAN
FF	FINISHED FLOOR		
FLEX	FLEXIBLE	TSP	TOTAL STATIC PRESSURE
FLR	FLOOR/FLOORING	TYP	TYPICAL
		UON	UNLESS OTHERWISE NOTED
GA	GAUGE	UG	UNDERGROUND
GC	GENERAL CONTRACTOR	UH	UNIT HEATER
GEN	GENERAL		
GYP	GYPSUM BOARD	V	VENT (PLUMBING)
		V	VOLTAGE (ELECTRICAL)
HP	HEAT PUMP	VTR	VENT THROUGH ROOF
Hp	HORSEPOWER		
HT	HEIGHT	W/	WITH
HW	HOT WATER	W/O	WITHOUT
HWC	HOT WATER CIRC	WP	WATERPROOF
HR	HOUR	WT	WEIGHT
HWR	HEATING WATER RETURN	WTR	WATER
HWS	HEATING WATER SUPPLY	WW	WASTE WATER
		WCO	WALL CLEANOUT
LOC	LOCATION	WH	WATER HEATER

MECHANICAL LEGEND

SYMBOL	ABB.	DESCRIPTION
	FD	FIRE DAMPER (RE: ARCHITECTURAL DRAWINGS FOR RATED WALL LOCATIONS)
	FSD	COMBINATION FIRE/SMOKE DAMPER
	DB	DUCT BARRIER WITH SECURITY 1/2" BARS (6 x 6) EQUAL TO PRICE MODEL MSBG
T	TSTAT	THERMOSTAT/CONTROL DEVICE
TS		REMOTE TEMPERATURE SENSOR
H		HUMIDISTAT
CO2		CARBON DIOXIDE SENSOR
F		FIRESTAT
SD		SMOKE DETECTOR
AH		ABSOLUTE HUMIDITY SENSOR
M	MOD	MOTOR OPERATED DAMPER
VS		VENTILATION SWITCH
SA —	SINGLE LINE	LONG RADIUS 90° ELBOW
SA —	SINGLE LINE	BRANCH TAKE-OFF WITH DAMPER
SA —	SINGLE LINE	RADIUS DUCT SPLIT W/LOCKING SPLITTER DAMPER
		CEILING SUPPLY AIR DEVICE
		CEILING RETURN OR EXHAUST DEVICE
D		CONDENSATE DRAIN
		BALL VALVE – 2" AND SMALLER BUTTERFLY VALVE – LARGER THAN 2"
	O.B.D.	OPPOSED BLADE DAMPER
		SMOKE SUPPLY GRILLE
		POINT OF CONNECTION
		MANUAL DAMPER (OBD WHEN ON MAU DUCTWORK)
AD		DUCT ACCESS DOOR

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

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B.J. HENDRIX
94813
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY B.J. HENDRIX, P.E. NO. 94813 on 01/11/2019

REFERENCE GENERAL NOTES ON SHEETS M1.1, P1.1, AND E1.1 FOR ADDITIONAL INFORMATION

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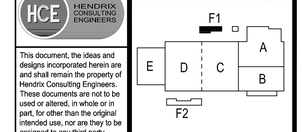

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
SCHEDULES, NOTES, AND LEGENDS - MECHANICAL

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
M1-1

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MISCELLANEOUS EQUIPMENT SCHEDULES

ELECTRIC UNIT HEATERS

ELECTRIC UNIT HEATER (EUH):
MANUFACTURED BY MARKEL WITH MOUNTING BRACKETS POWER DISCONNECT AND BUILT-IN THERMOSTAT. MOUNT AT 9' ABOVE FINISHED FLOOR.

MARK NO.	MODEL NO.	KW	VOLT/PH	APPROX. WT.	.	.
AREA "F1"					.	.
EUH-1F1	G1G5103N	3.3	277/1	35	.	.
EUH-2F1	G1G5103N	3.3	277/1	35	.	.
EUH-3F1	G1G5103N	3.3	277/1	35	.	.
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COVE HEATERS

COVE HEATER (CH):
MARKEL ELECTRIC COVE HEATER CONSTRUCTED OF .962" THICK ALUMINUM. THE HEATER SURFACE SHALL BE CONCAVE IN CONTOUR AND SAW-TOOTH IN PROFILE. THE FINISH SHALL BE OF BAKED WHITE ENAMEL. THE HEATERS SHALL BE AVAILABLE IN RATINGS FROM 450 THROUGH 1250 WATTS, AT 120, 240, 208 AND 277 VOLTS. THE HEATING ELEMENT SHALL BE OF NICHROME WIRE, EMBEDDED IN MAGNESIUM OXIDE POWDER, ENCLOSED AND SEALED IN ALUMINUM METAL TUBING. THE HEATER SHALL BE LISTED BY UNDERWRITERS LABORATORIES, INC. AND THE ELEMENTS SHALL BE SUPPLIED WITH A ONE YEAR LIMITED WARRANTY. PROVIDE WALL MOUNTED LINE VOLTAGE THERMOSTAT.

MARK NO.	MARKEL MODEL NO.	WATTS GRS	VOLTS	LENGTH	WEIGHT	NOT USED
AREA "F1"						.
CH-1F1	CV125027X	1250	277/1	120"	24	.
CH-2F1	CV125027X	1250	277/1	120"	24	.
CH-3F1	CV10027X	1000	277/1	96"	20	.
CH-4F1	CV10027X	1000	277/1	96"	20	.
CH-5F1	CV10027X	1000	277/1	96"	20	.
CH-6F1	CV10027X	1000	277/1	96"	20	.
CH-7F1	CV10027X	1000	277/1	96"	20	.
CH-8F1	CV10027X	1000	277/1	96"	20	.
CH-9F1	CV10027X	1000	277/1	96"	20	.
CH-10F1	CV10027X	1000	277/1	96"	20	.
CH-11F1	CV125027X	1250	277/1	120"	24	.
CH-12F1	CV10027X	1000	277/1	96"	20	.
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OSCILLATING WALL FANS

CIRCULATING FAN (CF):
DAYTON, TWO SPEED, OSCILLATING WALL FAN. PROVIDE WITH SUITABLE WALL BRACKET FOR OSCILLATING FANS.

MARK NO.	STOCK/ MODEL NUMBER	CFM	HP	VOLT/PH	BLADE DIAMETER	OSCILLATING
AREA "F1"						
CF-1F1	1VCF2	4700/3055	1/4	120/1	20"	YES
CF-2F1	1VCF2	4700/3055	1/4	120/1	20"	YES
CF-3F1	1VCF2	4700/3055	1/4	120/1	20"	YES
CF-4F1	1VCF2	4700/3055	1/4	120/1	20"	YES
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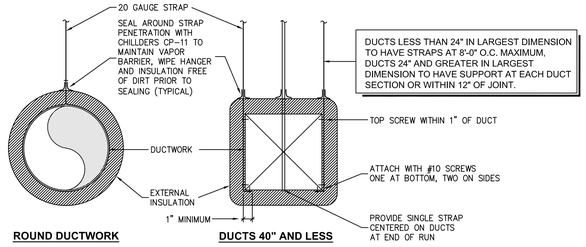
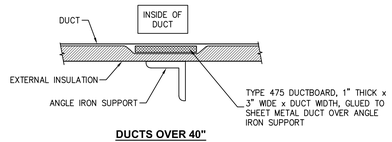
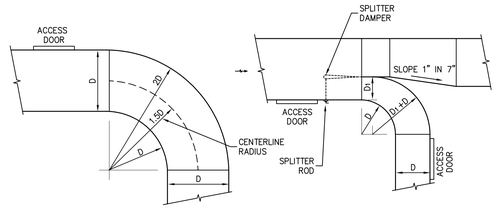


ROUND DUCTWORK **DUCTS 40" AND LESS**

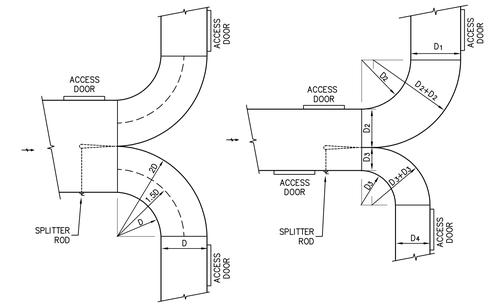


DUCTS OVER 40"

DUCT DETAILS
NO SCALE MDE08

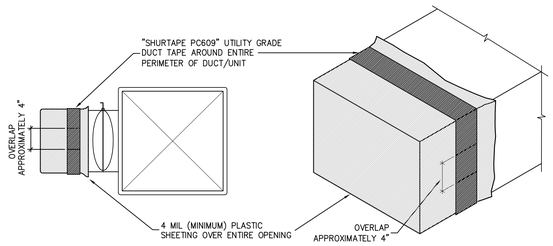


LONG RADIUS RECTANGULAR ELBOW **UNEQUAL SPLIT LONG RADIUS**



EQUAL SPLIT LONG RADIUS **UNEQUAL SPLIT LONG RADIUS**

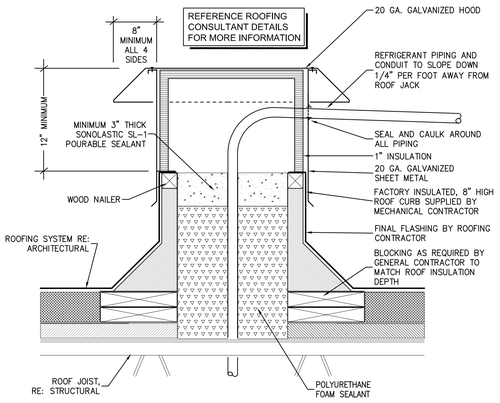
SPLITTER DETAIL
NO SCALE MDE06



SPIN-IN **OPEN DUCT/UNIT CONNECTION**

A. CAP OPEN ENDS OF ALL DUCTS (INCLUDING SPIN-INS) AND EQUIPMENT WITH PLASTIC TO PREVENT CONSTRUCTION DEBRIS AND DUST FROM ENTERING OPENINGS DURING CONSTRUCTION.
B. COVER ALL OPEN ENDS OF DUCTWORK WHILE SITTING ON GROUND (NOT INSTALLED). ALL PREFABRICATED DUCTWORK IN SHOP SHALL COME WITH ENDS PREWRAPPED WHEN DELIVERED TO THE SITE.
C. CONTRACTOR SHALL CLEAN ALL DUCTWORK THAT IS NOT PROTECTED PROPERLY DURING CONSTRUCTION.

DIRT BUSTER DETAIL
NO SCALE MDE10



ROOF JACK DETAIL
NO SCALE MDE69

PHOTO SHOWING RELATIONSHIP BETWEEN WALL MOUNTED LIGHTS AND COVE HEATERS
SCALE: NONE

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

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B.J. HENDRIX
94813
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY B.J. HENDRIX, P.E. No. 94813 ON 01/11/2019

REFERENCE GENERAL NOTES ON SHEETS M1.1, P1.1, AND E1.1 FOR ADDITIONAL INFORMATION

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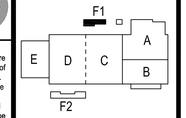

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
DETAILS - MECHANICAL

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
M1-2

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HOOD INFORMATION – Job#2414462

HOOD NO.	TAG	MODEL	LENGTH	MAX. COOKING TEMP.	EXHAUST PLENUM						TOTAL SUPPLY CFM	HOOD CONSTRUCTION	HOOD CONFIG.	
					TOTAL EXH. CFM	RISER(S)								
						WIDTH	LENG.	DIA.	CFM	S.P.			END TO END	ROW
1	H-F1	5430 ND-2-PSP-F	8' 0.00"	450 Deg.	1520			14"	1520	-0.497"	1216	430 SS Where Exposed	ALONE	ALONE

HOOD INFORMATION

HOOD NO.	TAG	FILTER(S)					LIGHT(S)			UTILITY CABINET(S)				FIRE SYSTEM PIPING	HOOD HANGING WGHT
		TYPE	QTY.	HEIGHT	LENGTH	EFFICIENCY @ 9 MICRONS	QTY.	TYPE	WIRE GUARD	LOCATION	FIRE SYSTEM		ELECTRICAL	SWITCHES		
											TYPE	SIZE	MODEL #	QUANTITY		
1		Captrate Solo Filter	6	20"	16"	93% See Filter Spec.	3	L55 Series E26	NO	Left	Ansul R102	3.0	SC-111110FP	1 Light 1 Fan	YES	712 LBS

HOOD OPTIONS

HOOD NO.	TAG	OPTION
1		FIELD WRAPPER 12.00" High Front, Left, Right
		BACKSPLASH 80.00" High X 108.00" Long 430 SS Vertical
		RIGHT VERTICAL END PANEL 27" Top Width, 21" Bottom Width, 80" High Insulated 4" Legs 430 SS
		LEFT VERTICAL END PANEL 27" Top Width, 21" Bottom Width, 80" High Insulated 4" Legs 430 SS

PERFORATED SUPPLY PLENUM(S)

HOOD NO.	TAG	POS.	LENGTH	WIDTH	HEIGHT	TYPE	RISER(S)				
							WIDTH	LENG.	DIA.	CFM	S.P.
1		Front	108"	12"	6"	MUA	8"	36"		605	0.141"
						MUA	8"	36"		605	0.141"

SPECIFICATION: CAPTRATE® GREASE-STOP® SOLO FILTER

THE CAPTRATE GREASE-STOP SOLO FILTER IS A SINGLE-STAGE FILTER FEATURING A UNIQUE S-BAFFLE DESIGN IN CONJUNCTION WITH A SLOTTED REAR BAFFLE DESIGN, TO DELIVER EXCEPTIONAL FILTRATION EFFICIENCY.

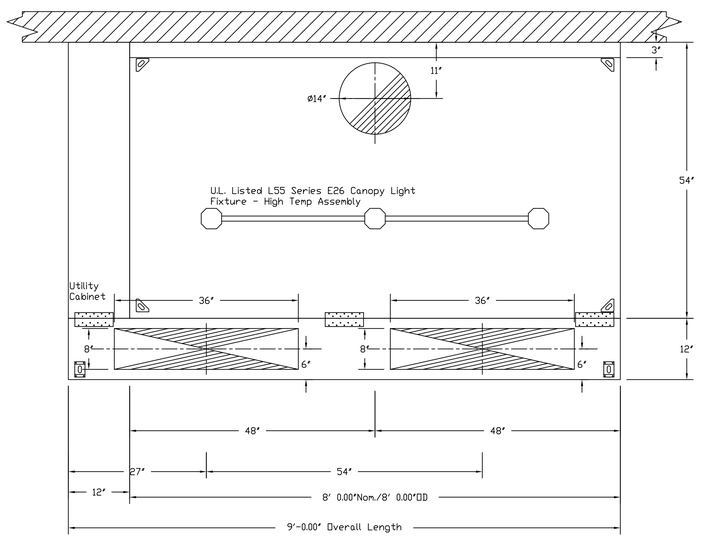
FILTER IS STAINLESS STEEL CONSTRUCTION, AND SIZED TO FIT INTO STANDARD 2-INCH DEEP HOOD CHANNEL(S).

UNITS SHALL INCLUDE STAINLESS STEEL HANDLES AND A FASTENING DEVICE TO SECURE THE TWO COMPONENTS WHEN ASSEMBLED.

GREASE EXTRACTION EFFICIENCY PERFORMANCE SHALL REMOVE AT LEAST 75% OF GREASE PARTICLES FIVE MICRONS IN SIZE, AND 90% GREASE PARTICLES SEVEN MICRONS IN SIZE AND LARGER, WITH A CORRESPONDING PRESSURE DROP NOT TO EXCEED 1.0 INCHES OF WATER GAUGE.

THE CAPTRATE GREASE-STOP SOLO WAS TESTED TO ASTM STANDARD ASTM F2519-05.

CAPTRATE FILTERS ARE BUILT IN COMPLIANCE WITH:
NFPA #96
NSF STANDARD #2
UL STANDARD #1046
INT. MECH. CODE (IMC)



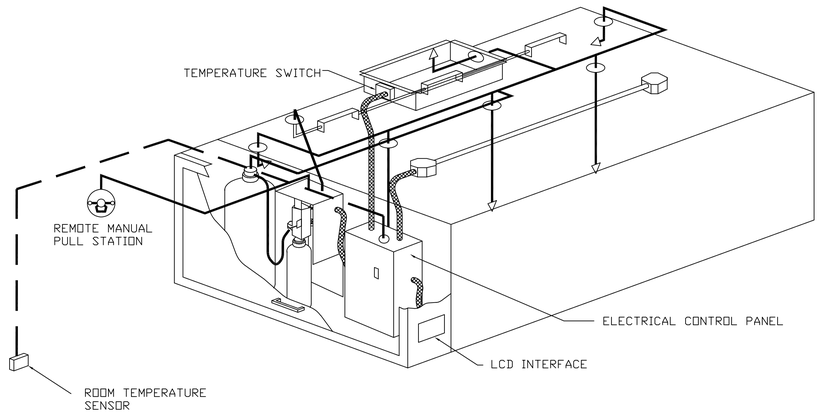
PLAN VIEW – Hood #1
8' 0.00" LONG 5430ND-2-PSP-F

Fire System Information – Job#2414462

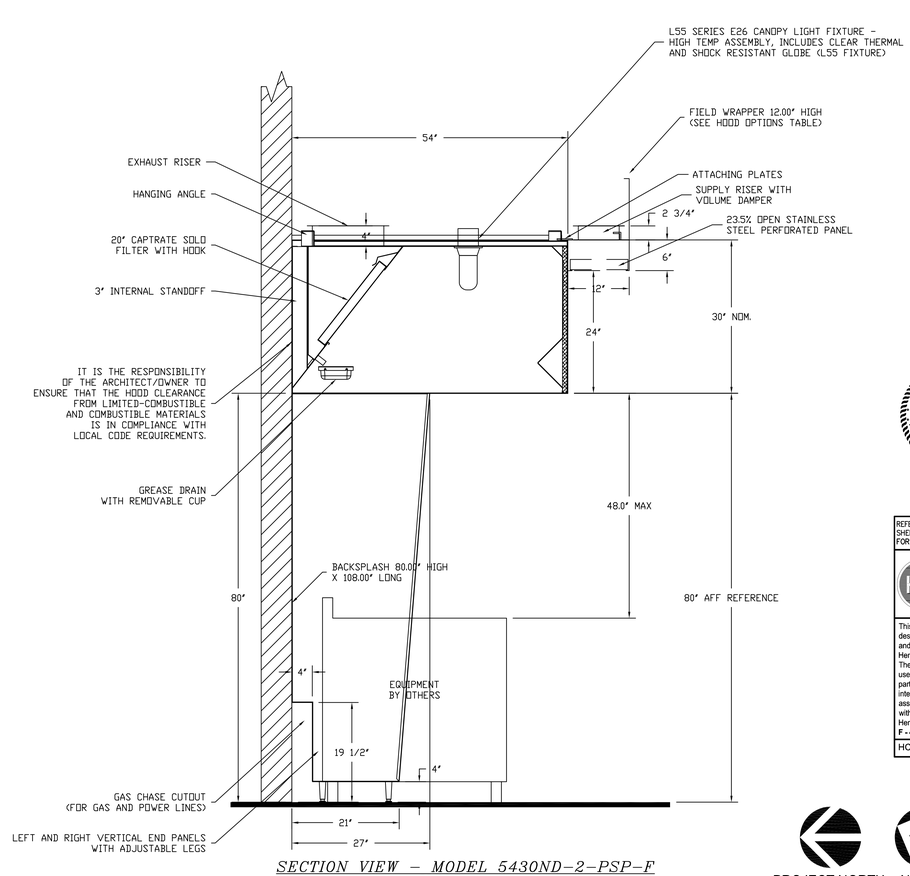
FIRE SYSTEM NO.	Tag	TYPE	SIZE	FLOW POINTS	INSTALLATION	
					SYSTEM	LOCATION ON HOOD
1		Ansul R102	3.0	2	Fire Cabinet Left	Left

GAS VALVE(S)

FIRE SYSTEM NO.	TAG	TYPE	SIZE	SUPPLIED BY
1		Mechanical	2.000	Distributor



TYPICAL FIRE SYSTEM AND TEMPERATURE INTERLOCK CONTROL PACKAGE INSTALLED IN HOOD UTILITY CABINET



SECTION VIEW – MODEL 5430ND-2-PSP-F
HOOD – #1

PROJECT NORTH NORTH

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5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

STATE OF TEXAS
BY: HENDRIX
94813
LICENSED
PROFESSIONAL ENGINEER

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HCE job no.: 19-003

F1
E D C A B
F2

PROJECT NO. 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
KITCHEN HOOD INFORMATION

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
M1.3

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EXHAUST FAN INFORMATION – Job#2414462

FAN UNIT NO.	TAG	FAN UNIT MODEL #	CFM	ESP.	RPM	H.P.	B.H.P.	Ø	VOLT	FLA	WEIGHT (LBS.)	SONES
1	KEF-1F1	DU85HFA	1520	1.000	1257	0.750	0.3800	1	115	9.8	76	13.6

MUA FAN INFORMATION – Job#2414462

FAN UNIT NO.	TAG	FAN UNIT MODEL #	BLOWER	HOUSING	CFM	ESP.	RPM	H.P.	B.H.P.	Ø	VOLT	FLA	WEIGHT (LBS.)	SONES
2	KSF-1F1	A1-G10	G10D	A1	1216	0.500	867	1.000	0.4750	1	115	10.2	194	18.2

FAN OPTIONS

FAN UNIT NO.	TAG	OPTION (Qty. - Descr.)
1		1 - Grease Box
2		1 - ECM Wiring Package for Exhaust Fans or Untempered Supply Fans - Manual Speed Control.

FAN ACCESSORIES

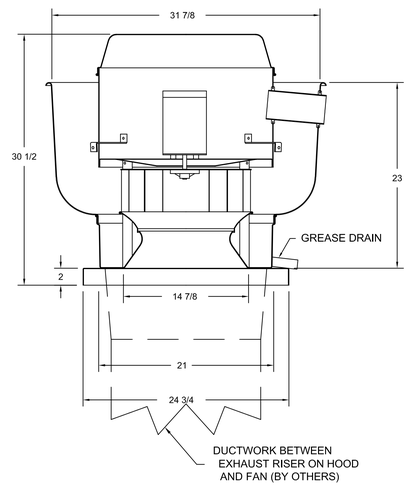
FAN UNIT NO.	TAG	EXHAUST			SUPPLY			
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1		YES						

CURB ASSEMBLIES

NO.	ON FAN	WEIGHT	ITEM	SIZE
1	# 1	36 LBS	Curb	23.000"W x 23.000"L x 20.000"H Vented Hinged
2	# 2	29 LBS	Curb	21.000"W x 21.000"L x 16.000"H

FAN #2 A1-G10 - SUPPLY FAN
1. DIRECT DRIVE DIRECT DRIVE UNTEMPERED SUPPLY UNIT WITH 10" BLOWER IN SIZE #1 HOUSING WITH SPEED CONTROL, DISCONNECT SWITCH.
2. INTAKE HOOD WITH EZ FILTERS-LOW CFM
3. DOWN DISCHARGE - AIR FLOW RIGHT -> LEFT
4. ECM WIRING PACKAGE AND MANUAL CONTROL FOR ECM MOTORS ON PRVS.

FAN #1 DU85HFA - EXHAUST FAN



FEATURES:

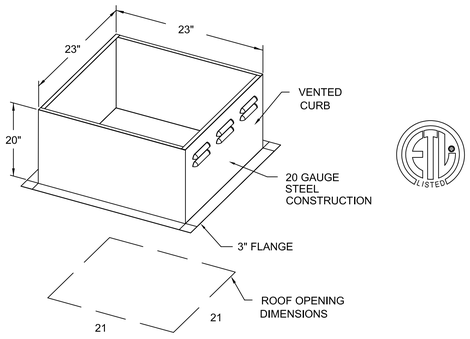
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL705 AND UL762
- VARIABLE SPEED CONTROL
- INTERNAL WIRING
- WEATHERPROOF DISCONNECT
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE)
- HIGH HEAT OPERATION 300°F (149°C)
- GREASE CLASSIFICATION TESTING

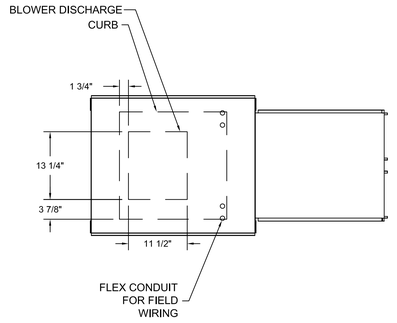
NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

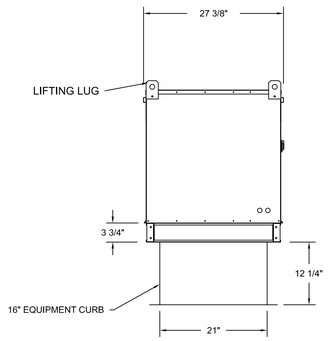
ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

OPTIONS

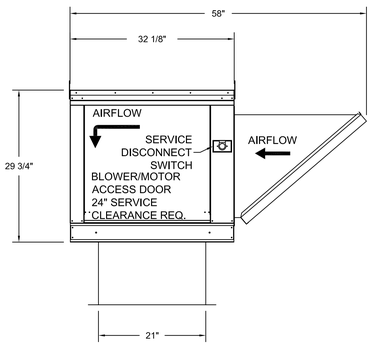
GREASE BOX







ROOF OPENING 2" SMALLER THAN CURB DIMENSION.



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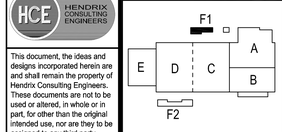

PROJECT NO. 14.3903

ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE:
KITCHEN HOOD INFORMATION

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

M1.4

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ELECTRICAL PACKAGES – Job#2414462

NO.	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED				
				LOCATION	QUANTITY		TYPE	Ø	H.P.	VOLT	FLA
1		SC-111110FP	Utility Cabinet Left	Utility Cabinet Left	1 Light	Smart Controls Thermostatic Control	Exhaust	1	0.750	115	9.8
				Hood # 1	1 Fan		Supply	1	1.000	115	10.2

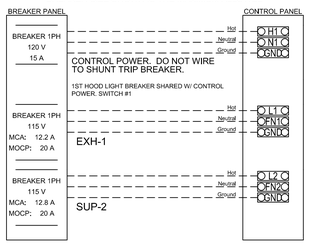
JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE
2414462	SC-111110FP		INSTALL
JOB NAME		**DATE**	**DWG NO**
Wilco Expo Center		8/20/2015	ECP #1-1

DESCRIPTION OF OPERATION:
120V 1 Phase w/ 1 Exhaust Fan, 1 Supply Fan, Exhaust on In Fire, Lights out In Fire, Fan(s) On/Off Thermostatically Controlled. Room temperature sensor shipped loose for field installation.

BREAKER PANEL TO CONTROL PANEL

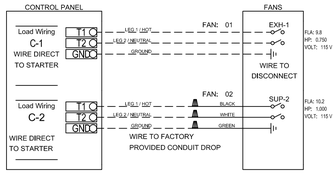
Responsibility: Electrician

BREAKER SIZE SHOWN IS THE MAXIMUM ALLOWED



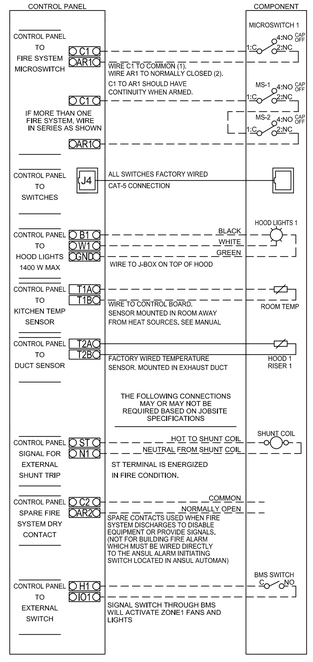
CONTROL PANEL TO FANS

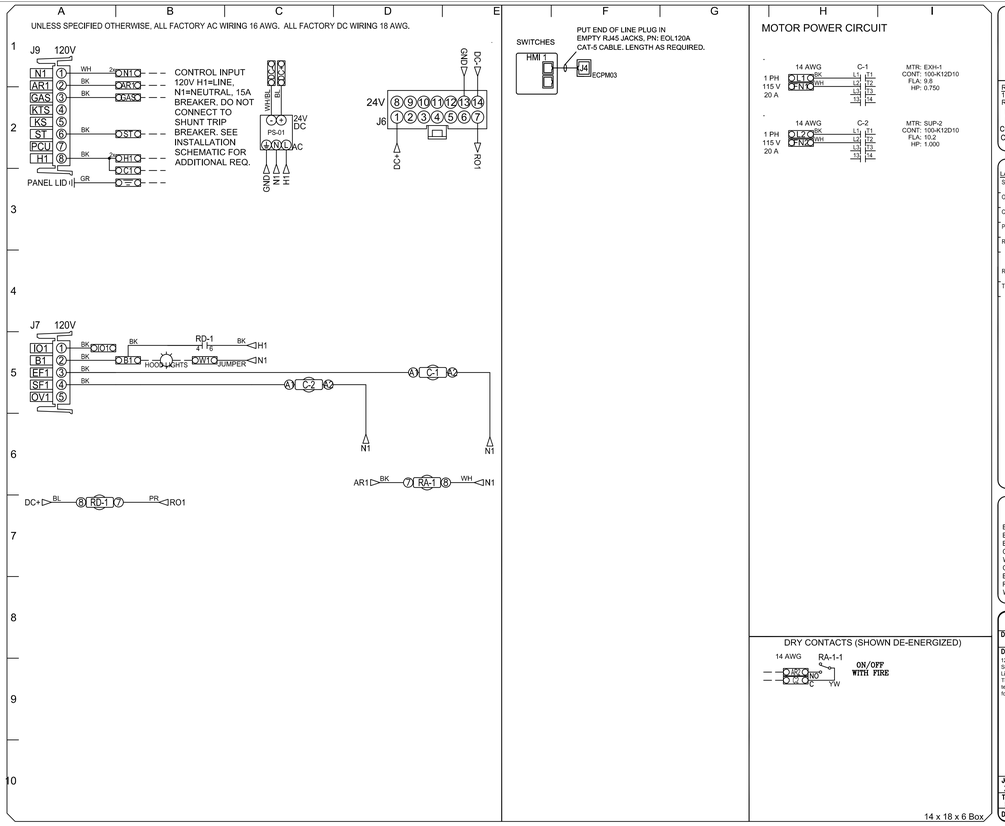
Responsibility: Electrician



CONTROL PANEL TO ACCESSORY ITEMS

Responsibility: Electrician





FACTORY WIRING SCHEMATIC CIRCUIT BOARDS ECPM03 Rev. 1.35 HMI Rev. 1.06	
RA-x 120VAC RELAY	RD-x 24 VDC RELAY
NO 4 3	14 NO
NC 2 1	12 NC
COIL 8 7	A1 A2 COIL
COM 6 5	11 COM

COMPONENT LIST

LABEL	DESCRIPTION
ST-x	Starter PN: varies
OL-X	Overload PN: varies
C-X	Contactor PN: varies
PS-1	Power Sup. 24VDC PN:MDP15-24A-1C
RA-x	120V Relay DPDT PN:34.11I3184.0
RD-x	24VDC Light Relay PN:34.11I3168.0
TS-x	Duct Thermostat PN:ACP-PO-T-KDPL

LEGEND

FIELD WIRING
FACTORY WIRING

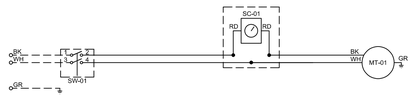
BK- BLACK YW- YELLOW
BL-BLUE GY- GREY
BR-BROWN PR- PURPLE
OR- ORANGE RD- RED
WH- WHITE
ORBL- ORBL STRIPE
BLRD- BLRD STRIPE
RDGN- RDGN STRIPE
WHBL- WHBL STRIPE

JOB NAME	Wilco Expo Cente...
DRAWING TITLE	SC-111110FP
DESCRIPTION OF OPERATION	120V 1 Phase w/ 1 Exhaust Fan, 1 Supply Fan, Exhaust on In Fire, Lights out In Fire, Fan(s) On/Off Thermostatically Controlled. Room temperature sensor shipped loose for field installation.

JOB NO	DRAWN BY
2414462	
TYPE	DATE
FACTORY	8/20/2015
DWG NO	ECP #1-2

Exhaust Fan Wiring

DRAWING NUMBER	EXH2414462-1	JOB	2414462 - Wilco Expo Center	
		SHIP DATE	8/20/2015	MODEL DU085HFA



Installed Options

Speed Control

Component Identification

Label	Description	Location
MT-01	Fan Motor	[2]
QD-01	Quick Disconnect	[2]
SC-01	Speed Control	[1]
SW-01	Main disconnect switch	[2]

MOTOR INFO
EXHAUST 0.75HP-115V-1PH-9.8FLA

ELECTRICAL INFORMATION
MOTOR/CTRL MCA: 12.3A
MOTOR/CTRL MOP: 20A

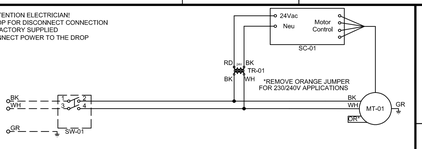
NOTES
DENOTES FIELD WIRING
DENOTES INTERNAL WIRING

WIRE COLOR

BK - BLACK	YW - YELLOW
BL - BLUE	GR - GREEN
BR - BROWN	GY - GRAY
OR - ORANGE	PR - PURPLE
RD - RED	PK - PINK
WH - WHITE	

AirHandler Wiring

DRAWING NUMBER	A2414462-2	JOB	2414462 - Wilco Expo Center	
		SHIP DATE	8/20/2015	MODEL A1-G10



Installed Options

Component Identification

Label	Description	Location
MT-01	Supply motor	[2]
SC-01	EV/ECM-VCU-36-MP	[1]
SW-01	Main disconnect switch	[2]
TR-06	24VAC 20VA Transformer	[1]

MOTOR INFO
SUPPLY 1HP-115V-1PH-10.2FLA

ELECTRICAL INFORMATION
MOTOR/CTRL CIRCUIT MCA: 12.8A
MOTOR/CTRL CIRCUIT MOP: 20A

NOTES
DENOTES FIELD WIRING
DENOTES INTERNAL WIRING

WIRE COLOR

BK - BLACK	YW - YELLOW
BL - BLUE	GR - GREEN
BR - BROWN	GY - GRAY
OR - ORANGE	PR - PURPLE
RD - RED	PK - PINK
WH - WHITE	

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HCE job no.: 19-003

F1 F2 A B C D E

PROJECT NO.	ISSUED BY
14.3903	POPULOUS
ISSUED DATE:	
1/11/2019	

SHEET TITLE:

KITCHEN HOOD INFORMATION

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

M1.5

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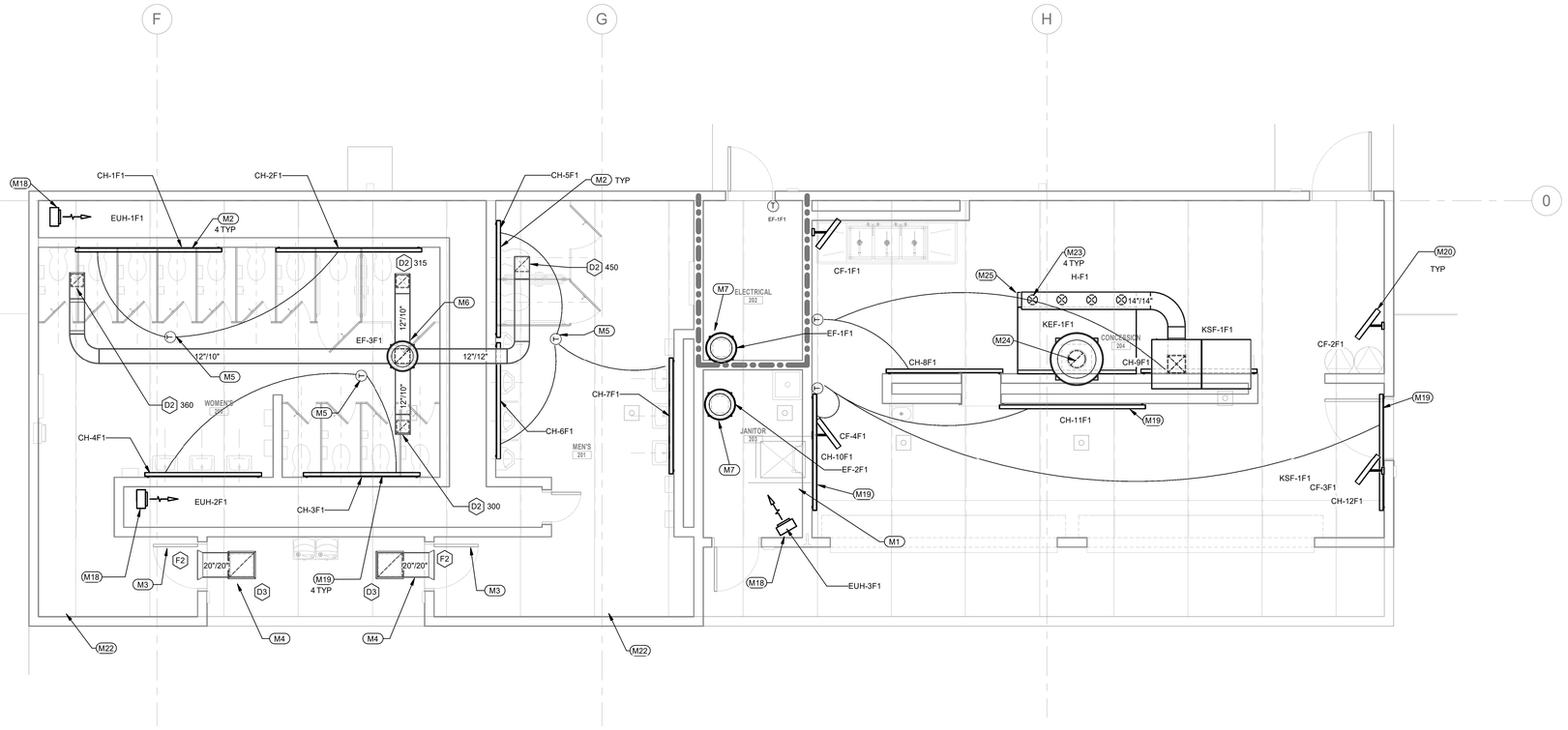
2/8/2019 11:16:58 AM

MECHANICAL KEYED NOTES

THESE NOTES APPLY TO THIS SHEET ONLY

M1	INSTALL SWITCH TO TOGGLE BETWEEN HIGH AND LOW SPEED SETTING FOR EF-3F1 (RESTROOM EXHAUST FAN). COORDINATE WITH FAN MANUFACTURER.
M2	COVE HEATERS IN RESTROOMS TO BE INSTALLED APPROXIMATELY 16" HIGHER THAN WALL MOUNTED LIGHT FIXTURES. REFERENCE DETAILS ON SHEET E2-1.
M3	DOOR HAS LOUVERED OPENING IN LOWER PORTION OF DOOR. REFERENCE ARCHITECTURAL.
M4	TRANSFER GRILLE IN SOFFIT AND GRILLE ON INSIDE WALL ABOVE DOOR CONNECTED BY DUCT.
M5	THERMOSTATS FOR COVE HEATER TO BE SECURED TO BOTTOM OF STRUCTURE. INITIALLY SET AT 50 DEGREES FAHRENHEIT (ADJUSTABLE), VERIFY EXACT TEMPERATURE SETTING DESIRED WITH OWNER.
M6	FAN TO BE TESTED AND BALANCED TO CFM'S SHOWN FOR LOW SPEED SETTING, CFM'S TO BE DOUBLED FOR HIGH SPEED SETTING ON MANUFACTURER'S FACTORY MOUNTED TWO SPEED CONTROLLER.
M7	PROVIDE 3" EXHAUST DUCT DROP, COVER OPEN END WITH 1/2" HARDWARE CLOTH MOUNTED IN A REMOVABLE FRAME.
M18	ELECTRIC UNIT HEATER FOR FREEZE PROTECTION. INSTALL AT 7'-0" TO BOTTOM OF HEATER. COORDINATE FINAL LOCATION WITH ALL TRADES PRIOR TO ROUGH-IN.
M19	RADIANT COVE HEATER, COORDINATE FINAL LOCATION WITH ARCHITECT. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
M20	CIRCULATING FAN, INSTALL AT 7'-0" TO BOTTOM OF FAN. COORDINATE FINAL LOCATION WITH ARCHITECT AND ELECTRICAL CONTRACTOR PRIOR TO ROUGH-IN.
M22	POWER IS BEING PROVIDED FOR FUTURE OWNER PROVIDED OSCILLATING FAN. RE: POWER PLAN.
M23	MAKE UP AIR DUCT TO CONNECT TO HOOD CONNECTION. PROVIDE TRANSITIONS AS REQUIRED.
M24	GREASE EXHAUST DUCT TO CONNECT TO HOOD EXHAUST CONNECTION. GREASE EXHAUST DUCT TO BE CONSTRUCTED PER SPECIFICATIONS FOR TYPE 1 KITCHEN HOOD EXHAUST DUCT. EXHAUST DUCT TO BE WRAPPED WITH FIRE RESISTING DUCT WRAP PER SPECIFICATIONS.
M25	TYPE 1 KITCHEN HOOD. REFERENCE KITCHEN HOOD INFORMATION DRAWINGS.



01 FLOOR PLAN - MECHANICAL

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

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HCE job no.: 19-003

F1
E D C A B
F2

PROJECT NO: 14.3903

ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE:

FLOOR PLAN - MECHANICAL

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

M2-1

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PIPE SIZING REQUIREMENTS

1. ALL FLOOR DRAINS AND FLOOR SINKS MUST HAVE TRAP PRIMERS. PROVIDE INVERTED TEE CONNECTION FROM SINK TAILPIECE OR FLUSH VALVE TYPE TRAP PRIMER CONNECTION TO ALL FLOOR DRAINS, FLOOR SINKS AND HUB DRAINS. AS LAST RESORT PROVIDE MECHANICAL TYPE TRAP PRIMER (PPP INC. "OREGON #1" TYPE). CONNECT TO NEAREST WATER SERVING THAT AREA PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. IN JURISDICTIONS WHERE PRESSURE ACTIVATED MECHANICAL PRIMERS ARE NOT ALLOWED, USE ELECTRONIC TRAP PRIMERS. COORDINATE POWER REQUIREMENTS WITH ELECTRICAL CONTRACTOR. PROSET "TRAP GUARD" DEVICE MAY BE USED IN LIEU OF TRAP PRIMERS WHEN ALLOWED BY LOCAL CODE AUTHORITY HAVING JURISDICTION. BEFORE USING PROSET "TRAP GUARD" CONTRACTOR MUST OBTAIN WRITTEN APPROVAL FROM LOCAL CODE AUTHORITY HAVING JURISDICTION AND PROVIDE COPIES TO ARCHITECT AND ENGINEER.
2. AT ALL PUBLIC LAVATORIES A HOT WATER MANIFOLD WILL BE ROUTED PARALLEL TO HOT WATER RECIRC MAIN DOWN FULL SIZE INTO ONE SIDE OF CHASE AND WILL BE CONNECTED BACK TO HOT WATER RECIRC MAIN OUT OF OPPOSITE SIDE OF CHASE TO COMPLY WITH INTERNATIONAL ENERGY CODE (IECC) MAXIMUM ALLOWABLE HOT WATER PIPING LENGTH FROM MANIFOLD. (TAP SIZE: FOR 3/8", PIPING MAXIMUM LENGTH = 3 FEET; FOR 1/2" MAXIMUM LENGTH = 2 FEET)
3. PIPING SIZE FOR WATER MAIN DROPS AND MANIFOLD IN CHASE OR WALL TO REMAIN FULL SIZE OF DROP INDICATED. REFERENCE FIXTURE CONNECTION SCHEDULE FOR INDIVIDUAL LINE SIZE TO EACH FIXTURE.
4. COORDINATE ALL WASTEWATER FLOOR PENETRATIONS AND PIPING PENETRATIONS WITH STRUCTURAL PRIOR TO INSTALLATION. PIPING MAY BE OFFSET SLIGHTLY TO AVOID STRUCTURAL CONFLICTS.
5. ROUTE VENT FROM EACH FIXTURE TO HORIZONTAL VENT HEADER IN CHASE/WALL OR TO NEAREST COMMON VTR ABOVE CEILING. REFERENCE FIXTURE CONNECTION SCHEDULE FOR INDIVIDUAL FIXTURE VENT SIZES. VENT HEADERS IN CHASE TO BE SIZED ACCORDINGLY: 1 1/2" VENT UP TO 6 DRAIN FIXTURE UNITS MAXIMUM DEVELOPED LENGTH OF 60 FEET (EXCEPT FOR WATER CLOSETS), 2" VENT UP TO 20 DRAIN FIXTURE UNITS MAXIMUM DEVELOPED LENGTH OF 120 FEET, 3" VENT UP TO 84 DRAIN FIXTURE UNITS MAXIMUM DEVELOPED LENGTH OF 212 FEET AND 4" VENT UP TO 256 DRAIN FIXTURE UNITS MAXIMUM DEVELOPED LENGTH OF 300 FEET. BRANCH VENTS EXCEEDING 40 FEET IN DEVELOPED LENGTH ARE TO BE INCREASED BY ONE PIPE SIZE. NO MORE THAN 1/3 OF THE CODE PERMITTED DEVELOPED LENGTH SHALL BE IN HORIZONTAL POSITION. EXTEND COMMON VENT UP THROUGH ROOF.
6. ROUTE ALL VENTS TO NEAREST COMMON VENT THRU ROOF (VTR) TO MINIMIZE ROOF PENETRATIONS. **VTR TO BE MINIMUM 15 FEET AWAY FROM OUTSIDE AIR INTAKES. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO INSTALLATION.**

FIXTURE CONNECTION SCHEDULE

MARK	CW	HW	WASTE	DRAIN FIXTURE UNITS	VENT	
WATER CLOSET (FLUSH VALVE)	1"	–	4"	6	2"	
WATER CLOSET (TANK TYPE)	1/2"	–	4"	4	2"	
URINAL	3/4"	–	2"	2	2"	
PUBLIC LAVATORY∗	3/8"	3/8"	2"	1	1 1/2" ∗∗	
SINK ∗∗∗	1/2"	1/2"	2"	2	1 1/2" ∗∗	
SERVICE SINK	3/4"	3/4"	3"	2	2"	
WASH FOUNTAIN ∗	1/2"	1/2"	2"	2	1 1/2" ∗∗	
EWC	1/2"	–	2"	1	1 1/2" ∗∗	
WASHING MACHINE	3/4"	3/4"	2"	2	2"	
HOSE BIBB	3/4"	–	–	–	–	
SHOWER ∗∗∗∗	1/2"	1/2"	3"	2	1 1/2"	
FLOOR DRAIN	–	–	3"	2	2"	

∗ HOT AND COLD WATER REQUIRED UNLESS NOTED OTHERWISE ON PLUMBING FIXTURE SCHEDULE. PROVIDE TEMPERATURE MIXING VALVE (ASSE 1070) AT THE FIXTURE.

∗∗ IF HORIZONTAL VENT LENGTH EXCEEDS 20 FEET, INCREASE VENT SIZE TO TWO INCHES.

∗∗∗ COMMERCIAL KITCHEN SINKS GET HOT WATER, REMAINDER TO BE PROVIDED WITH TEMPERATURE MIXING VALVE (ASSE 1070) AT THE FIXTURE.

∗∗∗∗ SHOWER VALVES TO BE BALANCED-PRESSURE, THERMOSTATIC OR COMBINATION BALANCED-PRESSURE/THERMOSTATIC CONFORMING TO ASSE 1016.

PLUMBING LEGEND

SYMBOL	ABB.	DESCRIPTION
	CW	COLD WATER PIPING
	HW	HOT WATER PIPING
	HWR	HOT WATER RETURN PIPING
	WW	WASTE WATER
		VENT PIPING
T		TEMPERED WATER
G		GAS PIPING
F		FIRE LINE
GT		GREASE TRAP LINE
A		COMPRESSED AIR PIPING
D		RELIEF OR CONDENSATE DRAIN PIPING
SD	SD	STORM DRAIN
RL	RL	RAIN LEADER
ORL	ORL	OVERFLOW RAIN LEADER
		FULL PORT BALL PIPE ISOLATION VALVE
	HB	HOSE BIBB/WALL HYDRANT
		UNION
FD/FS	FD/FS	FLOOR DRAIN/FLOOR SINK
	HD	HUB DRAIN
	CO	CLEAN OUT
		DOUBLE CLEAN OUT
	WCO	WALL CLEAN OUT
		GAS COCK
		BALANCE VALVE
FLOW		CHECK VALVE
		POINT OF CONNECTION
		GAS PRESSURE REGULATOR

M/P ABBREVIATION SCHEDULE

AD	ACCESS DOOR	MAINT	MAINTENANCE
ABV	ABOVE	MAU	MAKEUP AIR UNIT
AFF	ABOVE FINISHED FLOOR	MAX	MAXIMUM
ARCH	ARCHITECT	MC	MECHANICAL CONTRACTOR
AUTO	AUTOMATIC	MBH	1000 BTU PER HOUR
AUX	AUXILIARY	MECH	MECHANICAL
AHU	AIR HANDLING UNIT	MH	MANHOLE
BD	BALANCE DAMPER	MIN	MINIMUM
BFF	BELOW FINISHED FLOOR	MISC	MISCELLANEOUS
BLDG	BUILDING	MTD	MOUNTED
BOD	BOTTOM OF DUCT	MOD	MOTOR OPERATED DAMPER
BOP	BOTTOM OF PIPE	NIC	NOT IN CONTRACT
BF	BOOSTER FAN	N.O.	NORMALLY OPEN
CLG	CEILING	N.C.	NORMALLY CLOSED
CLR	CLEAR/CLEARANCE	NO.	NUMBER
CO	CLEANOUT	NTS	NOT TO SCALE
COL	COLUMN	O/A	OUTDOOR AIR
CONC	CONCRETE	OBD	OPPOSED BLADE DAMPER
CONTR	CONTRACTOR	OC	ON CENTER(S)
CW	COLD WATER	OPNG	OPENING
CONN	CONNECTION	ORL	OVERFLOW RAINLEADER
CU	CONDENSING UNIT	OAH	OUTSIDE AIR HOOD
Cu	COPPER	PC	PLUMBING CONTRACTOR
CHS	CHILLED WATER SUPPLY	PH	PHASE
CHR	CHILLED WATER RETURN	PLBG	PLUMBING
DIA	DIAMETER	R/A	RETURN AIR
DN	DOWN	RE:	REFERENCE/REFER TO
DWG	DRAWING	REFRIG	REFRIGERANT
DH	DUCT HEATER	REF	REFRIGERATOR
E/A	EXHAUST AIR	REQD	REQUIRED
EC	ELECTRICAL CONTRACTOR	RHP	RADIANT HEAT PANEL
EF	EXHAUST FAN	RL	RAINLEADER
ELEC	ELECTRIC/ELECTRICAL	RM	ROOM
EQ	EQUAL	RTU	ROOFTOP UNIT
EQUIP	EQUIPMENT	S/A	SUPPLY AIR
EX	EXISTING	SCH	SCHEDULE
EXH	EXHAUST	SP	STATIC PRESSURE
E.S.P.	EXTERNAL STATIC PRESSURE	SPEC	SPECIFICATION
ERV	ENERGY RECOVERY VENTILATOR	SD	STORM DRAIN
FCO	FLOOR CLEAN OUT	SF	SUPPLY FAN
FCU	FAN COIL UNIT	TSP	TOTAL STATIC PRESSURE
FF	FINISHED FLOOR	TYP	TYPICAL
FLEX	FLEXIBLE	UON	UNLESS OTHERWISE NOTED
FLR	FLOOR/FLOORING	UG	UNDERGROUND
GA	GAUGE	UH	UNIT HEATER
GC	GENERAL CONTRACTOR	V	VENT (PLUMBING)
GEN	GENERAL	V	VOLTAGE (ELECTRICAL)
GYP	GYPSUM BOARD	VTR	VENT THROUGH ROOF
HP	HEAT PUMP	W/	WITH
Hp	HORSEPOWER	W/O	WITHOUT
HT	HEIGHT	WP	WATERPROOF
HW	HOT WATER	WT	WEIGHT
HWC	HOT WATER CIRC	WTR	WATER
HR	HOUR	WW	WASTE WATER
HWR	HEATING WATER RETURN	WCO	WALL CLEANOUT
HWS	HEATING WATER SUPPLY	WH	WATER HEATER
LOC	LOCATION		

GENERAL NOTES

A. THE CONTRACTOR IS TO VISIT THE SITE PRIOR TO BID TO FAMILIARIZE HIMSELF WITH ALL CONDITIONS AS THEY EXIST. SUBMISSION OF BID INDICATES THE CONTRACTOR'S UNDERSTANDING OF EXISTING CONDITIONS AND HIS WILLINGNESS TO WORK WITH THESE CONDITIONS. NO ADDITIONAL TIME OR MONEY WILL BE ALLOTTED DUE TO LACK OF COORDINATION WITH EXISTING CONDITIONS OR OTHER TRADES.

B. CONTRACTORS TO REVIEW AND COMPARE ALL DRAWINGS SO ALL WORK IN THEIR RESPECTIVE TRADE IS INCLUDED IN BID. EACH CONTRACTOR SHALL INCLUDE ALL MATERIALS AND INSTALLATION REQUIRED FOR HIS PARTICULAR TRADE AFTER COMPLETE REVIEW OF ALL CONTRACT DRAWINGS AND SPECIFICATIONS.

C. ALL WORK SHALL COMPLY WITH THE APPLICABLE LOCAL, STATE AND FEDERAL CODES AND ORDINANCES. FOLLOW RECOMMENDED PRACTICES AS SET DOWN BY ASME, ASHRAE, NFPA, APPLICABLE BUILDING CODE, APPLICABLE MECHANICAL CODE, APPLICABLE PLUMBING CODE, APPLICABLE ENERGY CODE, NATIONAL ELECTRICAL CODE, AGA, ADA AND OSHA, AS THEY APPLY TO THIS PROJECT EXCEPT IN CASES WHERE LOCAL STATUTES GOVERN.

D. THE CONTRACTOR SHALL VERIFY WITH AUTHORITY HAVING JURISDICTION THE LATEST ADOPTED LOCAL CODES, ORDINANCES AND AMENDMENTS THAT APPLY TO THIS PROJECT. PROVIDE CODE APPROVED CONDENSATE DISPOSAL POINT FOR ALL MECHANICAL EQUIPMENT TO DRAIN TO. COORDINATE WITH MECHANICAL CONTRACTOR.

E. ABSOLUTELY NO PIPING OR DUCTWORK CAN BE ROUTED ABOVE ELECTRICAL PANELS, GEAR OR TRANSFORMERS. THE ONLY HVAC, PLUMBING, SPRINKLER OR DUCTWORK THAT CAN ENTER AN ELECTRIC ROOM ARE THOSE SPECIFICALLY SERVING THAT ROOM. THESE SERVICES CAN ONLY ENTER INTO ELECTRIC ROOM ABOVE ENTRY DOOR.

F. PROVIDE VALVE TAGS FOR ALL VALVES. PROVIDE CEILING ACCESS MARKERS FOR VALVES LOCATED ABOVE CEILING OR BEHIND WALL MOUNTED PANEL.

G. PLUMBING PIPING SHALL NOT BLOCK ACCESS TO EQUIPMENT, JUNCTION BOXES, DISCONNECTS, ACCESS DOORS, ETC.

H. ALL VALVES ARE TO BE ACCESSIBLE AND SHALL NOT BE LOCATED MORE THAN FOUR FEET ABOVE THE CEILING.

I. CONTRACTOR TO CONNECT COLD WATER, HOT/TEMPERED WATER, WASTE WATER AND VENT PIPING TO ALL FIXTURES PER MANUFACTURER'S RECOMMENDATIONS, UNLESS OTHERWISE NOTED ON DRAWINGS.

J. BEFORE ANY CUTTING OR TRENCHING OPERATIONS BEGIN, VERIFY WITH OWNER'S REPRESENTATIVE, UTILITY COMPANIES AND OTHER INTERESTED PARTIES THAT ALL AVAILABLE INFORMATION HAS BEEN PROVIDED CONCERNING EXISTING UTILITY LOCATION. VERIFY LOCATIONS GIVEN. CONTACT ARCHITECT IMMEDIATELY UPON UNCOVERING UNKNOWN UTILITIES FOR FURTHER DIRECTION. INDICATE ALL UNCOVERED UTILITIES ON RECORD DRAWINGS.

K. INSTALL ROOF JACK AS REQUIRED AT ALL GAS PIPING ROOF PENETRATIONS.

L. FIRE SEAL AROUND ALL PIPING AT PENETRATIONS THROUGH RATED WALLS, CEILINGS AND TUNNELS PER UL LISTED MATERIAL FOR ACTUAL SEALANT BEING USED. COORDINATE WITH ARCHITECTURAL PLANS FOR RATED WALL LOCATION.

M. PROVIDE ALL APPROPRIATE TOOLS, WRENCHES, KEYS, ETC. AS REQUIRED FOR ACCESS AND OPERATION OF VALVES, COVERS, ETC.

N. DO NOT ROUTE PIPING UNDER EQUIPMENT LOCATED ABOVE CEILING. ROUTE PIPING AROUND EQUIPMENT TO ALLOW FOR ACCESS AROUND EQUIPMENT AND FOR FUTURE REMOVAL OF EQUIPMENT.

O. PLUMBING CONTRACTOR IS RESPONSIBLE FOR PROVIDING FLUES AND COMBUSTION AIR PIPING TO EXTERIOR FOR GAS FIRED WATER HEATERS/BOILERS PROVIDED BY PLUMBER.

P. PROVIDE HEAT TRAPS ON INCOMING AND DISCHARGE LINES FROM WATER HEATERS WHICH DO NOT HAVE THEM FACTORY INSTALLED OR ARE NOT CONNECTED TO A RECIRCULATING SYSTEM.

Q. GAS PIPING:

1. SCHEDULE 40 BLACK IRON ONLY, NO GALVANIZED PIPING ALLOWED PROVIDE SUPPORTS FOR PIPING UNDER 2" AT SIX FEET ON CENTER. PROVIDE SUPPORTS FOR PIPING 2" AND OVER AT EIGHT FEET ON CENTER. ALL TAPS OFF MAIN TO EQUIPMENT ARE TO BE MADE OFF TOP OF MAIN. THIS ALLOWS FOR PROPER INSTALLATION OF SEDIMENT TRAP PRIOR TO UNIT OR REGULATOR CONNECTION WITH BOTTOM OF TRAP A MINIMUM OF 6" ABOVE FLOOR AND ALLOWS FOR SOME PIPE MOVEMENT WITHOUT BREAKAGE.
2. ROUTE PIPING DOWN MINIMUM TWELVE INCHES (12") UNDERGROUND AND STUB UP FOR NEW GAS METER/REGULATOR TO BE INSTALLED BY OWNERS PROPANE SUPPLIER. VERIFY GAS SERVICE LOCATION WITH CIVIL DRAWINGS AND OWNERS PROPANE SUPPLIER BEFORE INSTALLATION OF GAS PIPING. PRIME AND PAINT GAS RISER ON BUILDING TO MATCH BUILDING EXTERIOR. PIPING UNDERGROUND TO BE WRAPPED FOR PROTECTION. PROVIDE REMOVABLE TEST SECTION AND VALVING AS REQUIRED IN RISER.
3. PURGE ALL GAS PIPING WITH 100 PSI COMPRESSED AIR OR DRY NITROGEN FROM END OF RUN(S) BACK TO BUILDING CONNECTION WITH ALL EQUIPMENT SHUT OFF VALVES CLOSED TO PROTECT REGULATORS/GAS VALVES. FINAL PRESSURE TEST PIPING USING COMPRESSED AIR AT 60 PSI. SOAP ALL JOINTS. LINE SIZE FROM REGULATOR TO EQUIPMENT IS TO MATCH EQUIPMENT INLET CONNECTION SIZE. TRANSITION RIGHT AT REGULATOR. PRIME AND PAINT ALL THE EXPOSED GAS PIPING, COLOR AS SELECTED BY ARCHITECT.

PLUMBING FIXTURE SCHEDULE

NOTES:

1. REFERENCE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. ALL WALL HUNG FIXTURES TO BE INSTALLED WITH WALL CARRIERS, VERIFY CONFIGURATION TYPE.
3. PROVIDE VANDAL RESISTANT SCREWS AT ALL FIXTURES.
4. INSTALL STAINLESS STEEL CAPS AT ALL UNUSED LAVATORY FAUCET HOLES.
5. NO OFFSET FLANGES WILL BE ALLOWED FOR WATER CLOSET INSTALLATIONS.
6. GROUT FOR LEVELING WATER CLOSETS SHALL NOT EXTEND UP ON SIDE OF WATER CLOSET BASES. TAKE GROUT BACK TO MINIMUM 1/8" UNDER BASE AND CAULK FOR FINAL FINISH. VERIFY CAULK COLOR AND TYPE WITH ARCHITECT.
7. REFERENCE ARCHITECTURAL CONTRACT DOCUMENTS FOR EXACT LOCATION AND MOUNTING HEIGHTS OF ALL PLUMBING FIXTURES. CONTACT ARCHITECT FOR ADDITIONAL INFORMATION AS REQUIRED.
8. PROVIDE INVERTED TEE CONNECTION FROM SINK TAILPIECE OR FLUSH VALVE TYPE TRAP PRIMER CONNECTION TO ALL FLOOR DRAINS, FLOOR SINKS AND HUB DRAINS. AS LAST RESORT PROVIDE MECHANICAL TYPE TRAP PRIMER (PPP INC. "OREGON #1" TYPE). CONNECT TO NEAREST WATER SERVING THAT AREA PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
9. ALL PLUMBING FIXTURES TO BE "LEAD FREE" AB1953 COMPLIANT (.25% OR LESS AVERAGE LEAD CONTENT). PROVIDE DOCUMENTATION IN SUBMITTALS THAT THIS REQUIREMENT IS MET FOR EACH APPLICABLE FIXTURE.

WCW
WATER CLOSET: AMERICAN STANDARD #2257.001, WALL MOUNTED, VITREOUS CHINA, 1 1/2" TOP SPUD, ELONGATED BOWL. REFERENCE ARCHITECTURAL DRAWINGS FOR MOUNTING HEIGHT.
EXPOSED FLUSH VALVE: SLOAN ROYAL #111 WITH EBV-500-A SIDE MOUNT BATTERY PACK AUTO FLUSH, 1.28 GALLON FLUSH.
SEAT: BEMIS 1955C OR EQUIVALENT. STAINLESS STEEL HARDWARE ONLY (NO PLASTIC ALLOWED).

WCWH
WATER CLOSET (ADA): AMERICAN STANDARD #2257.001, WALL MOUNTED, VITREOUS CHINA, 1-1/2" TOP SPUD, ELONGATED BOWL. REFERENCE ARCHITECTURAL DRAWINGS FOR MOUNTING HEIGHT.
EXPOSED FLUSH VALVE: SLOAN ROYAL #111 WITH EBV-500-A SIDE MOUNT BATTERY PACK AUTO FLUSH, 1.28 GALLON FLUSH.
SEAT:BEMIS 1955C OR EQUIVALENT. STAINLESS STEEL HARDWARE ONLY (NO PLASTIC ALLOWED).

UR
URINAL: SLOAN #WEUS-1000.1403-0.13 SMOOTH VITREOUS CHINA, WASH DOWN ACTION 3/4" TOP SPUD WITH SLOAN ROYAL 1/8 GALLON FLUSH VALVE WITH EBV-500-A SIDE MOUNT BATTERY PACK AUTO FLUSH, FULLY MECHANICAL OVERRIDE.

URH
URINAL (ADA): SLOAN #WEUS-1000.1403-0.13 SMOOTH VITREOUS CHINA, WASH DOWN ACTION 3/4" TOP SPUD WITH SLOAN ROYAL 1/8 GALLON FLUSH VALVE WITH EBV-500-A SIDE MOUNT BATTERY PACK AUTO FLUSH, FULLY MECHANICAL OVERRIDE.

LH1
LAVATORY (ADA): AMERICAN STANDARD 0356.012, 20" x 18" VITREOUS CHINA, WALL HUNG, 4" FAUCET CENTERS AND GRID STRAINER. PROVIDE WITH TEMPERATURE MIXING VALVE EQUAL TO POWERS HYOROGUARD T/P e480 SERIES, .5 GPM MINIMUM FLOW, ASSE 1070, INTEGRAL CHECKS, 1.9 GPM AT 10 psi DROP.
FAUCET (ADA): T&S BRASS MODEL B-0890-CR-WS, 4" WRIST BLADE HANDLES, AERATOR.

HS
KITCHEN HAND SINK (ADA): ELKAY #ELVW02219ACTMC, 304 STAINLESS STEEL, NSF, COMPLETE WITH WALL HANGER, INTEGRAL STAINLESS STEEL SUPPORT BRACKETS, INTEGRAL OVERFLOW, LK723 THERMOSTATIC MIXING VALVE (ASSE 1070) AND LK721AC BATTERY POWERED, SENSOR OPERATED, DECK MOUNTED GOOSENECK FAUCET.

KS3
3 COMPARTMENT SINK: ELKAY #WNSF8372LR4, 14 GAUGE TYPE 304 STAINLESS STEEL, 1/4" RADIUS COVED CORNER CONSTRUCTION, THREE 24" x 24" x 14" DEEP BOWLS, 24" LEFT AND RIGHT DRAINBOARDS, 8" HIGH FULL LENGTH BACK SPLASH. 120" OVERALL LENGTH.
FAUCETS: TWO (2) ELKAY #LK945AT12T4T, 4" WRIST BLADE HANDLES. NO SPRAYERS.

SS
SERVICE SINK: FIAT #MSB-2424, ONE-PIECE MOLDED STONE WITH #832-AA HOSE AND HOSE BRACKET #E-77-AA VINYL BUMPER GUARD, MSG-2424 STAINLESS STEEL WALL GUARD AND #830-AA FAUCET.

DFH
DRINKING FOUNTAIN (ADA): ELKAY #EHWM17C, VANDAL RESISTANT, 14 GA HEAVY-DUTY STAINLESS STEEL, TWO (2) STATION. VANDAL RESISTANT PUSH BUTTON IN FRONT, VANDAL RESISTANT BUBBLERS, ELKAY #LKAPR2 HEAVY DUTY STAINLESS STEEL CANE APRON.

HB
HOSE BIBB: WOODFORD MODEL B67 SERIES, IN FLUSH MOUNTING WALL BOX, ASSE 1052 OR 1101 BACKFLOW PROTECTED AUTOMATIC DRAINING, FREEZELESS, NO SPRAYBACK. PROVIDE SHUT-OFF VALVE INSIDE BUILDING IN ACCESSIBLE LOCATION. SLOPE LINE FROM SHUT-OFF VALVE TO WALL HYDRANT TO ALLOW DRAINING OF LINE FOR FREEZE PROTECTION.

HB2
HOSE BIBB: WOODFORD MODEL 26, TEE KEY OPERATOR, ASSE 1052 OR 1101 BACKFLOW PREVENTER, CLOSE COUPLED, NO SPRAYBACK. PROVIDE SHUT-OFF VALVE INSIDE BUILDING IN ACCESSIBLE LOCATION. SLOPE LINE FROM SHUT-OFF VALVE TO WALL HYDRANT TO ALLOW DRAINING OF LINE FOR FREEZE PROTECTION.

WH1F1
WATER HEATER: A.O.SMITH MODEL BTX100, PROPANE, 96% EFFICIENT, 50 GALLON STORAGE, 100 MBH INPUT, 116 GPH RECOVERY AT 100° F. RISE, LO NOX, DIRECT VENT. PROVIDE WITH CONCENTRIC VENT ASSEMBLY.

FD
FLOOR DRAIN (GENERAL PURPOSE): C.I. BODY, FLASHING COLLAR, WEEPHOLES, ADJUSTABLE STAINLESS STEEL OR NICKEL BRONZE SQUARE TOP (6" x 6"). MIFAB F1100 CS-3 SERIES.

FD7
FLOOR DRAIN (KITCHEN): C.I. BODY, FLASHING COLLAR, WEEPHOLES, SECURED AND ADJUSTABLE STAINLESS STEEL OR NICKEL BRONZE SQUARE TOP (6" x 6") MINIMUM WITH COPPER SEDIMENT BASKET. TOP SIZE TO MATCH TILE SIZE AS CLOSE AS POSSIBLE, VERIFY TOP SIZE. MIFAB F1100 CS-3-5 SERIES.

FS
FLOOR SINK: 6" DEEP WITH ACID-RESISTING PORCELAIN ENAMEL INTERIOR, ALUMINUM INTERNAL DOME STRAINER, and STAINLESS STEEL GRATE (1/2 GRATE TYPE). MIFAB FS1720-3 SERIES.

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

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94813
LICENSED
PROFESSIONAL ENGINEER
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY B.A. HENDRIX, P.E. NO. 94813 on: 01/11/2019

REFERENCE GENERAL NOTES ON SHEETS M1.0, P1.1, AND E1.1 FOR ADDITIONAL INFORMATION

HCE HENDRIX CONSULTING ENGINEERS

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F - 4095

HCE job no.: 19-003

F1
E D C A B
F2

PROJECT NO. 14.3903 ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE:
SCHEDULES, NOTES, AND LEGENDS - PLUMBING

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
P1-1

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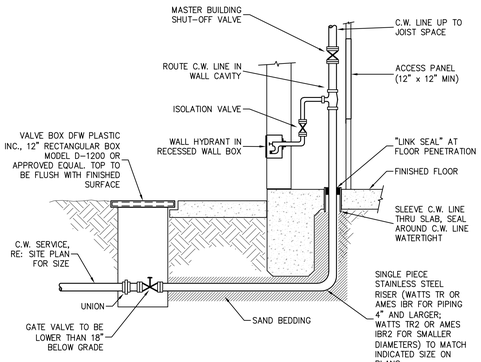
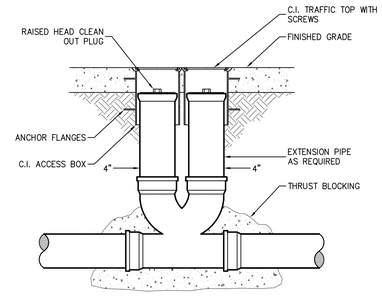


C.W. BUILDING ENTRY DETAIL

NO SCALE PDE52



DOUBLE CLEANOUT DETAIL

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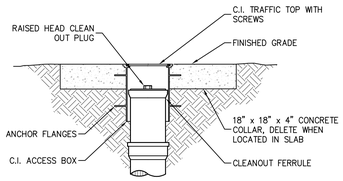

EXTERIOR CLEANOUT

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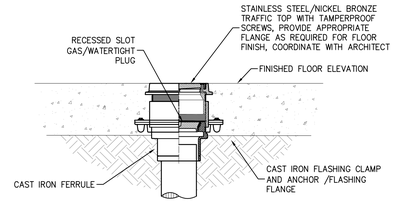
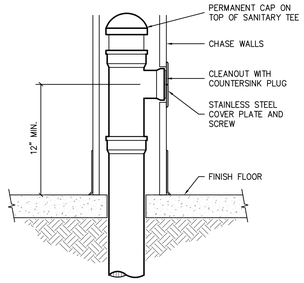


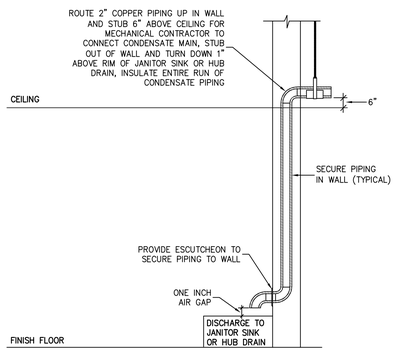
INTERIOR FLOOR CLEANOUT

NO SCALE PDE55



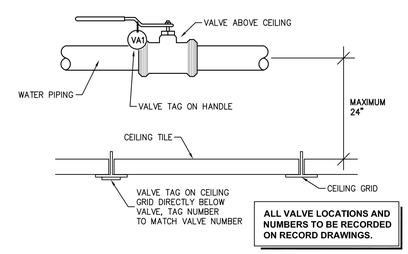
WALL CLEANOUT

NO SCALE PDE89



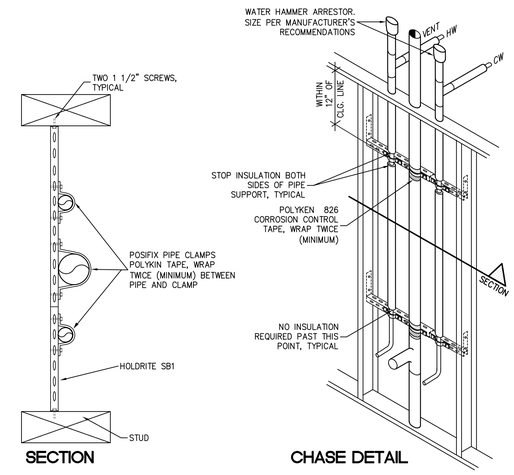
TYPICAL CONDENSATE STUB DETAIL

SCALE: NONE PDE37



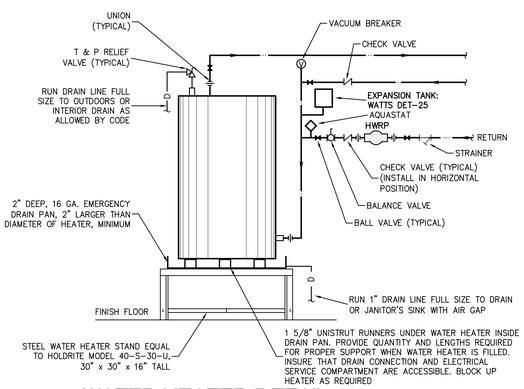
TYPICAL VALVE IDENTIFICATION DETAIL

SCALE: NO SCALE PDE27



TYP. PLUMBING CHASE SUPPORT DETAIL

NO SCALE PDE30



WATER HEATER DETAIL

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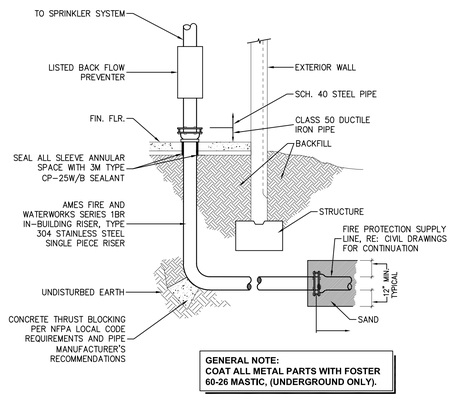

FIRE LINE RISER SUPPORT DETAIL

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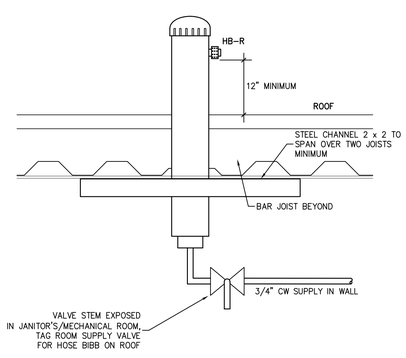

HOSE BIBB AT ROOF

NO SCALE PDE38

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

STATE OF TEXAS — BRIAN R. HENDRIX — 94813 — LICENSED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY BRIAN R. HENDRIX, NO. 94813 ON 01/11/2019

REFERENCE GENERAL NOTES ON SHEETS M1.1, P1.1, AND E1.1 FOR ADDITIONAL INFORMATION

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HCE job no.: 19-003

F1 F2 A B C D E

PROJECT NO. 14.3903 ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE: SCHEDULES - PLUMBING

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

P1-2

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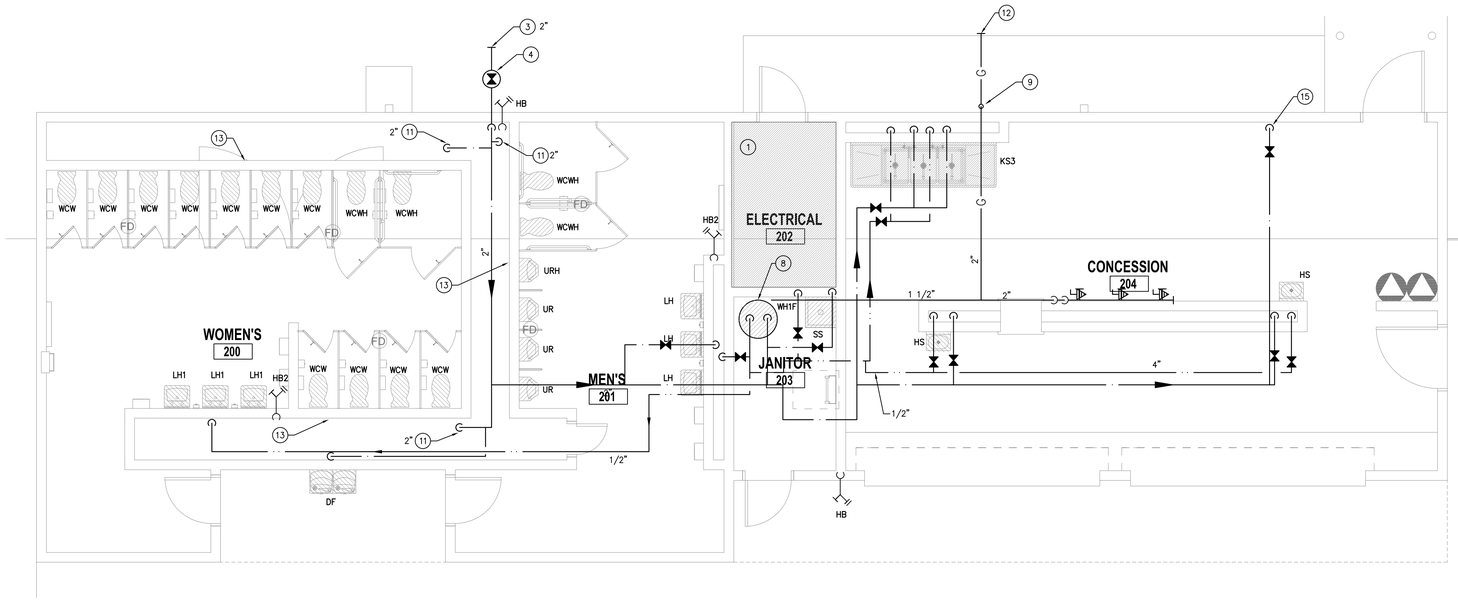
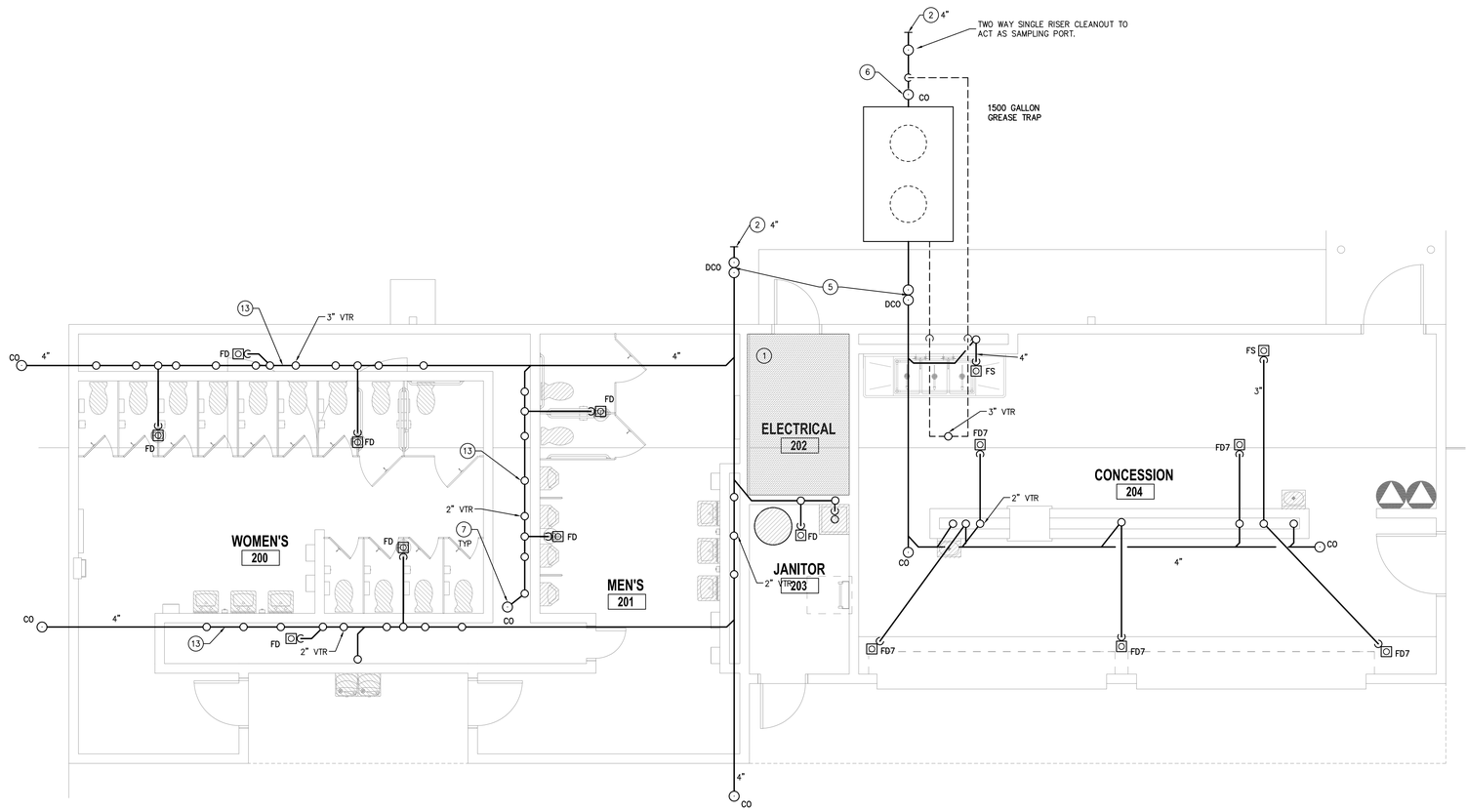


02 FLOOR PLAN - PLUMBING - SUPPLY

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



01 FLOOR PLAN - PLUMBING - WASTE

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

KEYED NOTES

THESE NOTES APPLY TO THIS SHEET ONLY

1. DO NOT ROUTE ANY PIPING ABOVE THIS AREA.
2. CONNECT TO WASTEWATER (WW) STUB PROVIDED BY CIVIL. FIELD VERIFY EXACT LOCATION AND INVERT. PROVIDE ADAPTER AS REQUIRED TO MAKE SIZE AND/OR MATERIAL TRANSITION.
3. CONNECT TO COLD WATER (CW) STUB PROVIDED BY CIVIL. FIELD VERIFY EXACT LOCATION.
4. RE: CW BUILDING ENTRY DETAIL ON PLUMBING DETAIL SHEET(S).
5. RE: DOUBLE CLEANOUT DETAIL ON PLUMBING DETAIL SHEET(S).
6. RE: EXTERIOR CLEANOUT DETAIL ON PLUMBING DETAIL SHEET(S).
7. RE: INTERIOR CLEANOUT DETAIL ON PLUMBING DETAIL SHEET(S).
8. RE: WATER HEATER DETAIL ON PLUMBING DETAIL SHEET(S) FOR WATER HEATER PIPING.
9. PROVIDE GAS SHUT-OFF VALVE AND REGULATOR TO LOW PRESSURE (OZ) IN RISER. PAINT RISER TO MATCH BUILDING. LOW PRESSURE GAS TO ENTER BUILDING ABOVE CEILING. ROUTE TO HOOD AND WATER HEATER. PROVIDE SOLENOID SHUT-OFF VALVE INTERLOCKED WITH HOOD FIRE PROTECTION SYSTEM. PROVIDE THREE (3) 1" STUBS WITH VALVES EVENLY SPACED UNDER HOOD FOR FUTURE EQUIPMENT.
10. WATER DOWN TO PENTAIR EVERPURE i2000² WATER FILTRATION CARTRIDGE FOR ICE MAKER.
11. COLD WATER (CW) DOWN INSIDE PLUMBING CHASE TO SERVE RESTROOM. PROVIDE SHUT-OFF VALVE AT APPROXIMATELY 48" ABOVE FINISHED FLOOR (A.F.F.).
12. LP (PROPANE) GAS TO CONNECT TO GAS STUB PROVIDED BY LOCAL UTILITY COMPANY. FIELD VERIFY EXACT LOCATION.
13. ALL PLUMBING TO BE HELD TIGHT TO PLUMBING FIXTURE WALL TO MAINTAIN A CLEAR PATH IN CHASE FOR ACCESS AND MAINTENANCE.
14. PROVIDE SHUT-OFF VALVE AT 48" AND ADDITIONAL DRAIN VALVE OFF OF SUPPLY BELOW FOUNTAIN.

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CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

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B.J. HENDRIX
94813
LICENSED
PROFESSIONAL ENGINEER

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HCE job no.: 19-003

F1
A B C D E
F2

PROJECT NO. 14.3903

ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE:
FLOOR PLAN - PLUMBING

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

P2.1

PROJECT NORTH NORTH

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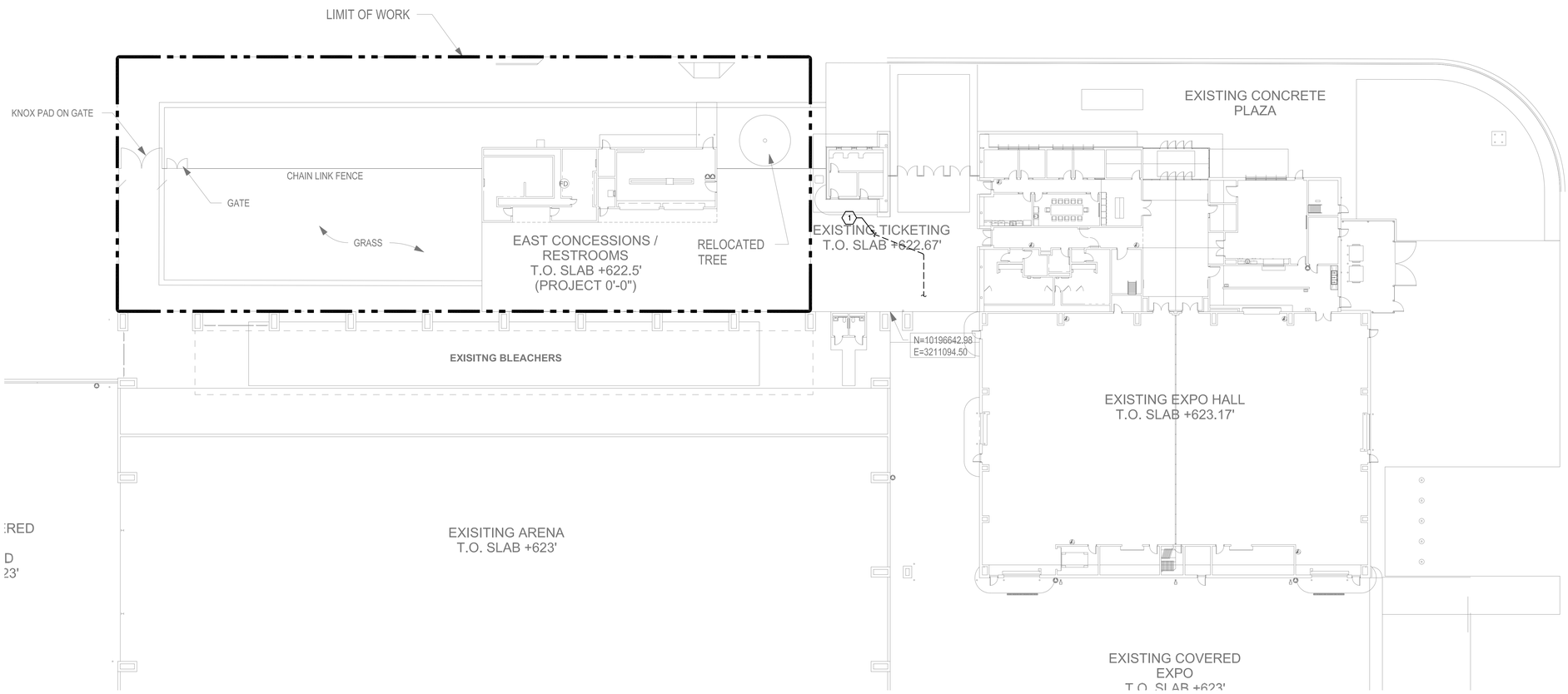
KEYED NOTES

THESE NOTES APPLY TO THIS SHEET ONLY

1. APPROXIMATE LOCATION OF EXISTING CONDUIT STUB. (1) 2 1/2" C FOR FEEDER TO 'HF1' AND (1) 1"C FOR SPECIAL SYSTEMS. FIELD COORDINATE EXACT LOCATION. EXTEND TO NEW BUILDING. REFERENCE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

NO SIT E LIGHTING SCOPE



01 SITE PLAN - ELECTRICAL
SCALE: 1" = 20'-0"

PROJECT NORTH

NORTH

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F1
E D C A B
F2

PROJECT NO. 14.3903

ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE:
SITE PLAN - ELECTRICAL

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
E1.0

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GENERAL NOTES

A. THE CONTRACTOR IS TO VISIT THE SITE PRIOR TO BID TO FAMILIARIZE HIMSELF WITH ALL CONDITIONS AS THEY EXIST. SUBMISSION OF BID INDICATES THE CONTRACTOR'S UNDERSTANDING OF EXISTING CONDITIONS AND HIS WILLINGNESS TO WORK WITH THESE CONDITIONS. NO ADDITIONAL TIME OR MONEY WILL BE ALLOTTED DUE TO LACK OF COORDINATION WITH EXISTING CONDITIONS OR OTHER TRADES.

B. CONTRACTOR IS TO REVIEW AND COMPARE ALL DRAWINGS SO ALL WORK IN THEIR RESPECTIVE TRADE IS INCLUDED IN BID. EACH CONTRACTOR SHALL INCLUDE ALL MATERIALS AND INSTALLATION REQUIRED FOR HIS PARTICULAR TRADE AFTER COMPLETE REVIEW OF ALL CONTRACT DRAWINGS AND SPECIFICATIONS.

C. ALL WORK SHALL COMPLY WITH THE CURRENT APPLICABLE LOCAL, STATE AND FEDERAL CODES AND ORDINANCES. FOLLOW RECOMMENDED PRACTICES AS SET DOWN BY NFPA, BUILDING CODE, MECHANICAL CODE, PLUMBING CODE, NATIONAL ELECTRICAL CODE, ADA AND OSHA, AS THEY APPLY TO THIS PROJECT, EXCEPT IN CASES WHERE LOCAL STATUTES GOVERN. THE CONTRACTOR SHALL VERIFY WITH AUTHORITY HAVING JURISDICTION THE LATEST ADOPTED LOCAL CODES, ORDINANCES AND AMENDMENTS THAT APPLY TO THIS PROJECT.

D. THE ELECTRICAL CONTRACTOR SHALL VERIFY SIZES OF BREAKERS, FUSES, WIRES, ETC., FOR ALL EQUIPMENT PROVIDED AND REPORT DISCREPANCIES TO THE ENGINEER/ARCHITECT PRIOR TO INSTALLATION OF CONDUIT. COORDINATE WITH MECHANICAL/ELECTRICAL COORDINATION SHEET PROVIDED BY MECHANICAL CONTRACTOR FOR ACTUAL EQUIPMENT BEING USED.

E. HOMERUNS SHALL BE COORDINATED WITH PANELBOARDS. ALL WIRING AND CONDUIT SHALL BE CONCEALED, EXCEPT IN ELECTRICAL ROOMS AND EXPOSED STRUCTURE AREAS.

F. ALL WIRING SHALL BE FREE OF SHORTS AND GROUNDS. NO WIRING SHALL BE LOADED BEYOND THE PERMITTED AMPACITIES ALLOWED BY CURRENT N.E.C.

G. MINIMUM WIRE/CONDUIT SIZES, EXCEPT FOR CLASS 2 LOW VOLTAGE CIRCUITS, ARE #12 AWG COPPER IN 1/2" CONDUIT. WHERE THE DISTANCE BETWEEN THE SUPPLYING PANEL AND THE FIRST BRANCH CIRCUIT RECEPTACLE OR LIGHT FIXTURE IS MORE THAN 100 FEET, UP SIZE CONDUCTOR TO ALLOW FOR MAXIMUM OF 3% VOLTAGE DROP FOR ACTUAL ROUTING OF CONDUITS TO DEVICE.

H. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, LABOR AND MATERIALS NECESSARY TO MAKE A COMPLETE AND WORKABLE SYSTEM.

I. CONFIRM THE EXACT LOCATION AND MOUNTING HEIGHTS OF LIGHTING FIXTURES WITH ARCHITECT BEFORE ROUGH-IN. COORDINATE REQUIRED CLEARANCES ABOVE FIXTURES WITH OTHER TRADES.

J. PROVIDE A TYPED PANEL DIRECTORY FOR ALL PANELBOARDS INDICATING FINAL INSTALLED CONDITION. CIRCUIT LABELING SHALL AGREE WITH EQUIPMENT DESIGNATIONS AND OWNERS FINAL ROOM NUMBERS.

K. LABEL ALL RECEPTACLES AND LIGHT SWITCHES WITH CIRCUIT NUMBER USING AN ELECTRONIC LABELER (BLACK ON CLEAR).

L. THE CONTRACTOR IS TO LAY OUT SERVICE ENTRANCE AND ELECTRIC ROOMS TO SCALE WITH ACTUAL GEAR TO BE INSTALLED TO ENSURE PROPER FIT AND CLEARANCES BEFORE INSTALLATION. COORDINATE ALL SERVICE CLEARANCE REQUIREMENTS WITH LOCAL UTILITY COMPANY. PROVIDE A 1/4" SCALE (MINIMUM) SHOP DRAWING. NOTIFY ARCHITECT/ENGINEERS OF ANY DIMENSIONAL PROBLEMS.

M. COORDINATE AND WIRE ALL DOOR HOLD OPEN DEVICES, AS REQUIRED. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS. ROUTE 120 VOLT POWER FROM NEAREST AVAILABLE CIRCUIT AS REQUIRED. PROVIDE ALL WIRING NECESSARY FOR A COMPLETE AND OPERATIONAL SYSTEM.

N. CONDUITS ROUTED TO ROOF SHALL BE INSTALLED IN SAME ROOF JACK AS MECHANICAL ELEMENTS. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE MECHANICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL PROVIDE ROOF JACK WHERE NO MECHANICAL ELEMENTS EXIST.

O. PROVIDE SLEEVES FOR SPECIAL SYSTEMS ABOVE EACH DOOR INTO A RATED EGRESS CORRIDOR, (1 - 2" AND 3 - 3/4"). FIRE SEAL ENDS AND UNUSED SLEEVES SHALL HAVE A SCREW CAP INSTALLED ON BOTH SIDES. USE THREADED CONDUIT.

P. ALL RECEPTACLES SERVING ELECTRIC WATER COOLERS SHALL BE LOCATED AT A HEIGHT SO AS NOT TO BE VISIBLE AFTER INSTALLATION OF EWC. COORDINATE MOUNTING HEIGHT WITH EQUIPMENT BEING PROVIDED. PROTECT WITH GFCI BREAKER.

Q. ALL CONDUITS ROUTED BELOW FINISHED FLOOR SHALL BE RUN BELOW THE GRADE BEAMS. CONDUITS AND MULTIPLE CONDUITS SHALL NOT PENETRATE GRADE BEAMS UNLESS COORDINATED WITH STRUCTURAL ENGINEER. OBTAIN WRITTEN APPROVAL FROM STRUCTURAL ENGINEER PRIOR TO BEGINNING WORK.

R. ALL EXPOSED CONDUIT SHALL BE RUN PARALLEL AND PERPENDICULAR TO STRUCTURE AND BUILDING LINES. COORDINATE FINAL CONDUIT ROUTING PATH WITH ARCHITECT AND ENGINEER PRIOR TO INSTALLATION.

S. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL 120 VOLT WIRING AND CONNECTIONS REQUIRED TO FIRE/SMOKE DAMPERS. COORDINATE EXACT LOCATIONS OF DAMPERS WITH MECHANICAL CONTRACTOR AND RELAY REQUIREMENTS WITH FIRE ALARM CONTRACTOR. CONNECT TO NEAREST AVAILABLE UNSWITCHED CIRCUIT UNLESS OTHERWISE INDICATED ON DRAWINGS.

T. ELECTRICAL CONTRACTOR SHALL CONNECT MOTORIZED BACK DRAFT DAMPERS FOR EXHAUST FANS FROM CIRCUIT FEEDING FAN. PROVIDE ALL MATERIAL AND LABOR TO MAKE CONNECTIONS.

U. ELECTRICAL CONTRACTOR SHALL WIRE ALL EXHAUST FANS TO BE CONTROLLED PER "EXHAUST FAN SCHEDULE" ON MECHANICAL SHEET. ELECTRICAL CONTRACTOR TO PROVIDE ALL RELAYS, CONTACTORS, SPRING WOUND TIMERS, ETC., AS REQUIRED PER SCHEDULE TO OPERATE AND CONTROL EXHAUST FAN. IF NO CONTROL IS SPECIFIED, EXHAUST FAN SHALL ENERGIZE WHEN LIGHTS IN ANY ROOM IT SERVES ARE POWERED ON. REFERENCE DETAIL ON ELECTRICAL SHEET FOR ADDITIONAL INFORMATION.

V. ELECTRICAL CONTRACTOR TO SEAL ALL PENETRATIONS OF ELECTRICAL WORK IN FIRE AND SMOKE RATED PARTITIONS, CEILINGS, ETC.

W. ELECTRICAL CONTRACTOR TO PROVIDE DISCONNECTING MEANS AND PROPER FUSING PROTECTION FOR ALL EQUIPMENT PER N.E.C. UNLESS OTHERWISE NOTED.

X. COORDINATE ALL DEVICES IN MILLWORK WITH ARCHITECTURAL MILLWORK SHOP DRAWINGS PRIOR TO ROUGH-IN.

Y. SENSOR OPERATED PLUMBING DEVICES: PLUMBING CONTRACTOR TO PROVIDE LOW VOLTAGE TRANSFORMERS FROM MANUFACTURER. ELECTRICAL CONTRACTOR IS TO PROVIDE ALL OTHER MATERIALS AND LABOR FOR COMPLETE INSTALLATION.

Z. SPRAY PAINT JUNCTION BOXES RED FOR FIRE ALARM SYSTEM. ALL OTHER SPECIAL SYSTEM JUNCTION BOXES TO BE PAINTED WHITE.

AA. DO NOT HANG ANY FIXTURES, EQUIPMENT OR CONDUIT FROM ROOF DECK.

BB. LABEL ALL JUNCTION BOXES WITH CIRCUIT NUMBERS.

CC. IDENTIFY RECEPTACLE CIRCUITS IN PANELBOARDS TO INDICATE FINAL ROOM NUMBERS. VERIFY FINAL ROOM NUMBERS PRIOR TO TYPING PANELBOARD SCHEDULES.

DD. MECHANICALLY FASTEN ALL LABELS TO EQUIPMENT.

EE. ELECTRICAL CONTRACTOR TO OBTAIN "MECH/ELEC COORDINATION SHEET" FILLED OUT FROM MECHANICAL CONTRACTOR. THIS SHEET IS TO BE INCLUDED WITH ELECTRICAL GEAR/PANELBOARD SUBMITTAL. SUBMITTAL WILL NOT BE CHECKED WITHOUT THIS FORM INCLUDED.

FF. ELECTRICAL CONTRACTOR IS TO PROVIDE ROUGH-IN FOR ALL MECHANICAL CONTROL DEVICES IN WALLS AND PENETRATIONS FOR CONTROL WIRES TO EXTERIOR UNITS. COORDINATE ALL LOCATIONS WITH MECHANICAL CONTRACTOR AND MECHANICAL SHEETS.

GG. DISCONNECTS MOUNTED ABOVE CEILING MUST BE MOUNTED TO BE READILY ACCESSIBLE NEAR UNIT. HANDLE TO BE NO MORE THAN 36" ABOVE CEILING GRID.

HH. ALL EXTERIOR DISCONNECTS ARE TO BE MOUNTED BELOW LINE OF SIGHT OF A SCREEN WALL OR IF SINGLE DISCONNECT, LEVEL WITH TOP OF CONDENSER. VERIFY LOCATION WITH ARCHITECT/ENGINEER PRIOR TO ROUGH-IN.

II. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ONE 120 VOLT, WEATHERPROOF GFCI DUPLEX RECEPTACLE WITHIN 25 FEET OF ALL PIECES OF NEW OR REPLACEMENT MECHANICAL EQUIPMENT LOCATED ON ROOF, MEZZANINE OR ON THE GROUND. CONNECT TO NEAREST AVAILABLE UNSWITCHED 120 VOLT 20 AMP CIRCUIT WITH LESS THAN 6 RECEPTACLES OR RUN TO NEAREST PANELBOARD AND PROVIDE HOMERUN WITH NEW 20 AMP CIRCUIT BREAKER.

ESC-68

PANELBOARD CONNECTION SCHEDULE

A. USE TABLE FOR WIRE AND CONDUIT SIZES FOR ALL PANELBOARDS UNLESS NOTED OTHERWISE.
B. WIRE SIZES BASED ON 86° AMBIENT, 75° COLUMN OF CHART. NEC 310.15(B)(16)
C. TABLE FOR 120/208/3PH/4W AND 277/480/3PH/4W PANELBOARDS.
D. PROVIDE 200% NEUTRAL BUS BAR AND 200% NEUTRAL WIRE WHEN SPECIFIED.

PANEL SIZE OR MCB SIZE	WIRE SIZE	GROUND	CONDUIT
60	4 #6	#10	1"
100	4 #3	#8	1 1/4"
125	4 #1	#6	1 1/2"
150	4 #1/0	#6	2"
200	4 #3/0	#6	2"
225	4 #4/0	#4	2 1/2"
300	4 #350	#4	3"
400	2 SETS 4 #3/0 OR	#3	2" PER SET
	1 SET 4 #600	#3	4"
600	2 SETS 4 #350	#1	3" PER SET
800	2 SETS 4 #600	#1/0	4" PER SET

ESC-15

ELECTRICAL ABBREVIATION SCHEDULE

A	AMPERES	MECH	MECHANICAL
A/C	AIR CONDITIONING	MH	MANHOLE
AFF	ABOVE FINISHED FLOOR	MIN	MINIMUM
AHJ	AUTHORITY HAVING JURISDICTION	MISC	MISCELLANEOUS
AL	ALUMINUM	MLO	MAIN LUG ONLY
AUTO	AUTOMATIC	MSB	MAIN SWITCHBOARD
AUX	AUXILIARY	NEC	NATIONAL ELECTRICAL CODE
BFF	BELOW FINISHED FLOOR	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
BLDG	BUILDING		
C	CONDUIT	NF	NON-FUSED
CB	CIRCUIT BREAKER	NIC	NOT IN CONTRACT
CKT	CIRCUIT	NTS	NOT TO SCALE
COL	COLUMN	OC	ON CENTER(S)
CONC	CONCRETE	OE	OVERHEAD ELECTRIC
CONST	CONSTRUCTION	OT	OVERHEAD TELEPHONE
CONTR	CONTRACTOR	PC	PLUMBING CONTRACTOR
CTV	CABLE TELEVISION	PH	PHASE
DWG	DRAWING	PNL	PANEL
EC	ELECTRICAL CONTRACTOR	PVC	POLYVINYL CHLORIDE
EF	EXHAUST FAN	RE	REFERENCE/REFER TO
DN	DOWN	RECPT	RECEPTACLE
ELEC	ELECTRIC/ELECTRICAL	RGS	RIGID GALVANIZED STEEL CONDUIT
EMT	ELECTRICAL METALLIC TUBING	RM	ROOM
EQUIP	EQUIPMENT	SCH	SCHEDULE
EX	EXISTING	SPEC	SPECIFICATIONS
FA	FIRE ALARM	TEL	TELEPHONE
FF	FINISHED FLOOR	TTB	TELEPHONE TERMINAL BOARD
FLR	FLOOR/FLOORING	TYP	TYPICAL
G	GROUND	UC	UNDERGROUND CONDUIT
GC	GENERAL CONTRACTOR	UE	UNDERGROUND ELECTRIC
GFI	GROUND FAULT INTERRUPT	UL	UNDERWRITER'S LABORATORIES
HD	HEAVY DUTY	UON	UNLESS OTHERWISE NOTED
HP	HORSEPOWER	UT	UNDERGROUND TELEPHONE
IMC	INTERMEDIATE METAL CONDUIT	V	VOLTS/VOLTAGE
KVA	KILOVOLT-AMPERES	VA	VOLT-AMPERES
KW	KILOWATTS	W	WATTS
LGT	LIGHT/LIGHTING	W/	WITH
MAX	MAXIMUM	W/O	WITHOUT
MC	MECHANICAL CONTRACTOR	WP	WEATHER PROOF
MCB	MAIN CIRCUIT BREAKER	XFMR	TRANSFORMER
MDP	MAIN DISTRIBUTION PANEL		

SPECIAL SYSTEMS SCOPE

ACCESS CONTROL SYSTEM
1. NONE OR BY OWNER.

SECURITY SYSTEM
1. NONE OR BY OWNER.

TECHNOLOGY SYSTEM
1. ROUGH-IN PER ELECTRICAL DRAWINGS.
2. CABLING AND DEVICE SPECIFICATION BY OWNER.
3. COORDINATE EQUIPMENT SCOPE WITH OWNER.

INTERCOM SYSTEM
1.NONE OR BY OWNER.

FIRE ALARM SYSTEM
1. EXPAND EXISTING GAMEWELL SYSTEM TO NEW RESTROOM/CONCESSION BUILDING. REFERENCE SPECIFICATIONS.

AUDIO-VIDEO SYSTEM
1. NONE OR BY OWNER.

MISCELLANEOUS EQUIPMENT SCHEDULES

GENERAL NOTES:

A. ELECTRICIAN TO PROVIDE 120V POWER TO ALL EQUIPMENT FROM NEAREST PANEL HAVING CAPACITY, UNLESS OTHERWISE NOTED.

B. ELECTRICAL CONTRACTOR IS TO PROVIDE ALL PARTS AND LABOR TO MAKE FINAL CONNECTIONS TO ALL EQUIPMENT SHOWN IN CONTRACT DOCUMENTS. POWER MAY BE SHOWN IN GENERAL LOCATION. IT IS EXPECTED THAT THE ELETRICAL CONTRACTOR COORDINATE FINAL LOCATION FOR ROUGH-IN AND CONNECTION REQUIREMENTS WITH EXACT EQUIPMENT BEING INSTALLED. THESE ITEMS INCLUDE, BUT NOT LIMITED TO, BOOK SECURITY, EXHAUST FANS, KILNS, HAND DRYERS, SENSOR OPERATED PLUMBING DEVICES, ELECTRIC OVERHEAD DOORS, FIRE SMOKE DAMPERS, AIR PURIFICATION UNITS, ETC.

POWER FOR SPECIAL SYSTEMS POWER SUPPLIES

1. ELECTRICAL CONTRACTOR TO PROVIDE POWER TO ALL SECURITY, FIRE ALARM, ACCESS CONTROL, ETC. POWER SUPPLIES. COORDINATE EXACT LOCATION WITH SPECIAL SYSTEMS CONTRACTOR AND FLOOR PLANS. PROVIDE DEDICATED LOW VOLTAGE CIRCUIT TO NEAREST PANEL HAVING CAPACITY U.O.N.
2. LABEL ALL SPECIAL SYSTEMS POWER SUPPLIES WITH PANEL AND CIRCUIT NUMBERS.

KITCHEN EXHAUST AND SUPPLY FANS

PROVIDE SINGLE POINT CONNECTION TO CONTROL PANEL. PROVIDE WIRE CONDUIT FOR CONNECTION FROM CONTROL PANEL (PANEL MAY BE LOCATED IN KITCHEN OR ON ROOF) TO ALL KEF'S AND TO KSF'S ON ROOF. REFERENCE EXHAUST FAN SCHEDULE ON MECHANICAL SHEETS FOR ADDITIONAL INFORMATION. ELECTRICAL CONTRACTOR TO PROVIDE ALL CONTROL WIRING AND MAKE ALL TERMINATION'S AND FEED THROUGH CONNECTIONS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM. CONTROL VOLTAGE TO BE OBTAINED FROM HOOD LIGHT CIRCUIT. TYPE OF CONNECTION VARIES BY MANUFACTURER. COORDINATE ALL REQUIREMENTS WITH ACTUAL FANS BEING SUPPLIED.

ESC-08

SPECIAL SYSTEM SYMBOL SCHEDULE

NOTE:
A. REFERENCE OWNER SPECIFICATIONS FOR ADDITIONAL INFORMATION.
B. THIS IS FOR GENERAL LOCATION ONLY. ALL DEVICES AND CABLING PER OWNER SPECIFICATIONS.

SYMBOL	DESCRIPTION	REMARKS
FACP	FIRE ALARM CONTROL PANEL	
FAAP	FIRE ALARM ANNUNCIATOR PANEL	
RVEP	REMOTE VOICE EVACUATION PANEL	
SWP	SPEAKER, WALL MOUNTED WEATHER RESISTANT, 120" AFF U.O.N.	
TV	TELEVISION POWER, 72" AFF U.O.N. OR SPECIFIED BY TECHNOLOGY CONSULTANT/OWNER	
UC	UTILITY CONTROLLER	
C	CLOCK, SINGLE FACED WALL MOUNTED, 96"± AFF UON	
C	CLOCK, DOUBLE FACED WALL MOUNTED, 96"± AFF UON	
CDU	CENTRAL DISPLAY UNIT	
WP	WEATHER PROOF EXTERIOR FIRE ALARM HORN	
K	SECURITY KEY PAD, 48" AFF UON	3/4"C TO ABOVE CEILING
B	BADGE READER FOR SECURITY SYSTEM, 48" AFF UON	3/4"C TO ABOVE CEILING
LC	LIGHTING RELAY ZONE OVERIDE CONTROL BUTTON	3/4"C TO ABOVE CEILING
M	MICROPHONE JACK	3/4"C TO ABOVE CEILING
C	ROUGH-IN FOR CAMERA (WEATHERPROOF BOX FLUSH WITH EXTERIOR WALL)	1"C TO ABOVE CEILING
C	CEILING MOUNTED CAMERA LOCATION (DATA DROP, CAMERA BY OTHERS)	
I	INTERCOM PROGRAM PHONE LOCATION	3/4"C TO ABOVE CEILING
	MAG DOOR HOLD OPEN. POWERED BY SPECIAL SYSTEMS	
LS	LOCK DOWN DEVICE	3/4"C TO ABOVE CEILING
D	120V POWER FOR DOOR SECURITY POWER SUPPLY	
HC	120V POWER FOR HANDICAP DOOR POWER SUPPLY	
B	DOOR BUZZER, CONFIRM LOCATION WITH OWNER.	3/4"C TO ABOVE CEILING
V	INTERCOM VOLUME CONTROL	3/4"C TO ABOVE CEILING
G	OVERHEAD DOOR POWER	
G	OVERHEAD DOOR CONTROL LOCATION	
S	INTERCOM SPEAKER	
HD	HAND DRYER POWER	SPECIFIED BY ARCHITECT
DW	DISHWASHER POWER	
F	CIRCULATING FAN POWER	
	WALL MOUNTED MOTION SENSOR	
F	FIRE SPRINKLER POWER	
BL	MOTORIZED BLINDS	

ESC-01

DEVICE SYMBOL SCHEDULE

NOTES:
A. ALL SYMBOLS DO NOT NECESSARILY APPEAR ON THESE DRAWINGS.
B. ALL DEVICE PART NUMBERS ARE HUBBELL UNLESS OTHERWISE NOTED.
C. ALL DEVICE HEIGHTS ARE REFERENCED TO CENTER OF DEVICE.

SYMBOL	DESCRIPTION	REMARKS
	SINGLE RECEPTACLE 20A/120V 18" AFF UON	HBL 5361-W
	DUPLEX RECEPTACLE 20A/120V 18" AFF UON	CR20-W
U	DUPLEX RECEPTACLE WITH DUAL USB 20A/120V 18" AFF UON	USB20X2W
	DUPLEX RECEPTACLE 20A/120V 18" AFF UON WITH GROUND FAULT INTERRUPTER	GF20ILA
IG	DUPLEX RECEPTACLE 20A/120V 18" AFF UON WITH ISOLATED/INSULATED GROUND	CR5352IG
	FOURPLEX RECEPTACLE 20A/120V 18" AFF UON	(2) CR20-W
U	FOURPLEX RECEPTACLE 20A/120V, (1) WITH DUAL USB 18" AFF UON	(1) CR20-W,(1) USB20X2W
C	CLOCK RECEPTACLE 120V 96" AFF UON	HBL 5235
	SPECIAL PURPOSE RECEPTACLE 18" AFF SEE PLANS FOR DETAILS	
	CEILING MOUNTED DUPLEX RECEPTACLE 20A/120V (FLUSH)	CR20-W
	DUPLEX RECEPTACLE 20A/120V MOUNTED HORIZONTALLY 48" AFF UON	CR20-W
P	FOURPLEX RECEPTACLE FOR PROJECTOR	
WP	WEATHER/TAMPER-RESISTANT DUPLEX RECEPTACLE WITH "IN-USE" COVER 20A/120V 18"AFF UON	GFTR20W/ WP26M
	8" ABOVE COUNTER - GFI	
SC	DUPLEX RECEPTACLE W/ SURGE SUPPRESSION 20A/120V 18" AFF UON	IG5362-SA
S	SAFETY TYPE DUPLEX RECEPTACLE 20A/120V 18" AFF UON	CR20TR-W
	DUPLEX RECEPTACLE, FLOOR MOUNTED FLUSH	CR20-W,PFBRG1 SB3083,S3825
	FOURPLEX RECEPTACLE, FLOOR MOUNTED FLUSH	(2) HBL-5362-W,PFBRG2 SB3084, (2)S3825
	EXISTING DUPLEX RECEPTACLE	
	EXISTING FOURPLEX RECEPTACLE	
	EXISTING 208V RECEPTACLE	
$	SINGLE POLE SWITCH 20A, 48"AFF UON	CS120-W
$D	DIMMER SWITCH, 48"AFF UON, SEE PLANS FOR DETAILS	
$P	SWITCH WITH PILOT LIGHT, 48"AFF UON	HBL1221-PL
$2	TWO POLE SWITCH 20A, 48"AFF UON	CS1222-W
$T	TIMER SWITCH, 48"AFF UON	INTERMATIC FF60MC
$F	FAN SWITCH, 48"AFF UON	RF51

ESC-02

DISTRIBUTION SYMBOL SCHEDULE

NOTES:
A. ALL SYMBOLS DO NOT NECESSARILY APPEAR ON THESE DRAWINGS.

SYMBOL	DESCRIPTION	REMARKS
	HOMERUN (REFER TO PANEL SCHEDULES FOR CONDUIT/WIRING)	
F	CIRCUIT ROUTED THRU CONTACTOR OR RELAY	
UE	UNDERGROUND ELECTRIC	
UT	UNDERGROUND TELEPHONE	
OE	OVERHEAD ELECTRIC	
OT	OVERHEAD TELEPHONE	
	CIRCUIT INDICATORS (HOT, NEUTRAL, GROUND, SWITCHLEG)	
P	PHOTOCELL	
J	JUNCTION BOX	
J	JUNCTION BOX, FLOOR MOUNTED FLUSH	
J	JUNCTION BOX, WALL MOUNTED - 3/4"C TO ABOVE CEILING	
M	MANUAL STARTER WITH THERMAL TRIP	
	DISCONNECT SWITCH, REFER TO DISCONNECT SCHEDULE	
	STARTER	
	COMBINATION STARTER/DISCONNECT SWITCH, REFER TO SCHEDULE	
	POWER AND/OR LIGHTING PANELBOARD, REFER TO PANELBOARD SCHEDULE	
	SWITCHBOARD, REFER TO SWITCHBOARD SCHEDULE	
	TRANSFORMER, REFER TO TRANSFORMER SCHEDULE	

ESC-05

TELECOMMUNICATION/DATA SYMBOL SCHEDULE

NOTES:
A. ALL SYMBOLS DO NOT NECESSARILY APPEAR ON THESE DRAWINGS.
B. PROVIDE 3/4" CONDUIT TO ABOVE CEILING WITH PULLSTRING AND PLASTIC BUSHING FOR ALL DEVICES, U.O.N.
C. PROVIDE 1" CONDUIT TO FLOOR MOUNTED DATA BOXES.
D. USE 4" x 4" x 2 1/8" JUNCTION BOX WITH SINGLE GANG PLASTER RING FOR ALL DEVICES.
E. REFERENCE SPECIFICATIONS FOR ALL WIRING AND REQUIREMENTS AT EACH DEVICE.
F. COMMUNICATION DROPS FOR SPECIAL SYSTEMS.
1. FIRE ALARM PANEL - PHONE AND DATA. (reference specifications)
2. SECURITY/ACCESS/INTERCOM/LIGHTING/DDC PANELS-MIN 1 DATA DROP PER PANEL. (reference specifications)

REMARKS:
1. 10 FEET SERVICE LOOP WITH DATA BISCUIT BOX ON END ABOVE CEILING, TIE OFF TO NEAREST JOIST. FINAL INSTALL OF AP DEVICE BY OWNER.

SYMBOL	DESCRIPTION	REMARKS
	TELEPHONE OUTLET	
	TELEPHONE OUTLET, FLOOR MOUNTED FLUSH	
	TELEPHONE OUTLET, WALL MOUNTED	
	COMBINATION SINGLE VOICE TELEPHONE/DUAL DATA	
	COMBINATION SINGLE VOICE TELEPHONE/DUAL DATA, FLOOR MOUNTED FLUSH	
	LAN SYSTEM OUTLET	
	DUAL DATA OUTLET	
P	SINGLE DATA FOR VOIP WALL PHONE	
	DUAL DATA OUTLET, FLOOR MOUNTED FLUSH	
	DUAL DATA OUTLET, CEILING MOUNTED FLUSH	
TEB	TELEPHONE EQUIPMENT BOARD	
4	COMBINATION DUAL VOICE TELEPHONE/DUAL DATA	
TB	TEACHER STATION, 4-11/16 J-BOX (2100) FOR PROJECTOR CONTROLS	2-1" CONDUITS
	TELEVISION OUTLET	2-1" CONDUITS
MR	MUDRING WITH 3-PULL STRINGS TO ABOVE CEILING	
P	PROJECTOR CONTROL PLATE, REFERENCE CLASSROOM AUDIO VIDEO SPECS	
AP	SINGLE DATA DROP FOR WIRELESS ACCESS POINT, (WALL MOUNT)	
AP	SINGLE DATA DROP FOR WIRELESS ACCESS POINT, (CEILING MOUNT)	1
AV	AUDIO/VISUAL WALL MOUNTED OUTLET	

ESC-19

BRANCH CIRCUIT WIRE AND CONDUIT SCHEDULE

NOTE:
A. PROVIDE INDIVIDUAL NEUTRALS FOR EACH CIRCUIT. NO SHARED NEUTRALS ALLOWED.

C - CONDUIT G - GROUND L - LINE OR PHASE N - NEUTRAL

MARK	WIRE AND CONDUIT	SYSTEM	MARK	WIRE AND CONDUIT	SYSTEM	MARK	WIRE AND CONDUIT	SYSTEM
1	2#12, 1/2"C.	LN	31	2#4, 1#8G., 1"C.	LLG	61	3#1/0, 1#6G., 2"C.	LLNG
2	2#12, 1#12G., 1/2" C.	LNG	32	3#4, 1" C.	LLL	62	3#1/0, 1#6G., 2" C.	LLLG
3	2#12, 1#12G., 1/2" C.	LLG	33	3#4, 1#8G., 1" C.	LLNG	63	4#1/0, 1#6G., 2" C.	LLLNG
4	3#12, 1/2" C.	LLL	34	3#4, 1#8G., 1" C.	LLLG	64	2#2/0, 1 1/2" C.	LN
5	3#12, 1#12G., 1/2" C.	LLNG	35	4#4, 1#8G., 1 1/4" C.	LLLNG	65	2#2/0, 1#4G., 1 1/2"C.	LNG
6	3#12, 1#12G., 1/2" C.	LLLG	36	2#3, 1" C.	LN	66	2#2/0, 1#4G., 1 1/2" C.	LLG
7	4#12, 1#12G., 1/2" C.	LLLNG	37	2#3, 1#8G., 1"C.	LNG	67	3#2/0, 1 1/2" C.	LLL
8	2#10, 1/2"C.	LN	38	2#3, 1#8G., 1" C.	LLG	68	3#2/0, 1#4G., 2" C.	LLNG
9	2#10, 1#10G., 1/2" C.	LNG	39	3#3, 1" C.	LLL	69	3#2/0, 1#4G., 2" C.	LLLG
10	2#10, 1#10G., 1/2" C.	LLG	40	3#3, 1#8G., 1 1/4" C.	LLNG	70	4#2/0, 1#4G., 2" C.	LLLNG
11	3#10, 1/2" C.	LLL	41	3#3, 1#8G., 1 1/4" C.	LLLG	71	2#3/0, 1 1/2" C.	LN
12	3#10, 1#10G., 1/2" C.	LLNG	42	4#3, 1#8G., 1 1/4" C.	LLLNG	72	2#3/0, 1#4G., 2" C.	LNG
13	3#10, 1#10G., 1/2" C.	LLLG	43	2#2, 1"C.	LN	73	2#3/0, 1#4G., 2" C.	LLG
14	4#10, 1#10G., 1/2" C.	LLLNG	44	2#2, 1#8G., 1" C.	LNG	74	3#3/0, 2" C.	LLL
15	2#8, 1/2" C.	LN	45	2#2, 1#8G., 1" C.	LLG	75	3#3/0, 1#4G., 2" C.	LLNG
16	2#8, 1#10G., 3/4" C.	LNG	46	3#2, 1 1/4" C.	LLL	76	3#3/0, 1#4G., 2" C.	LLLG
17	2#8, 1#10G., 3/4" C.	LLG	47	3#2, 1#8G., 1 1/4" C.	LLNG	77	4#3/0, 1#4G., 2 1/2" C.	LLLNG
18	3#8, 3/4" C.	LLL	48	3#2, 1#8G., 1 1/4" C.	LLLG	78	2#4/0, 2" C.	LN
19	3#8, 1#10G., 3/4" C.	LLNG	49	4#2, 1#8G., 1 1/4" C.	LLLNG	79	2#4/0, 1#4G., 2" C.	LNG
20	3#8, 1#10G., 3/4" C.	LLLG	50	2#1, 1 1/4" C.	LN	80	2#4/0, 1#4G., 2" C.	LLG
21	4#8, 1#10G., 1" C.	LLLNG	51	2#1, 1#6G., 1 1/4" C.	LNG	81	3#4/0, 2" C.	LLL
22	2#6, 3/4" C.	LN	52	2#1, 1#6G., 1 1/4" C.	LLG	82	3#4/0, 1#4G., 2 1/2" C.	LLNG
23	2#6, 1#10G., 3/4" C.	LNG	53	3#1, 1 1/2" C.	LLL	83	3#4/0, 1#4G., 2 1/2" C.	LLLG
24	2#6, 1#10G., 3/4" C.	LLG	54	3#1, 1#6G., 1 1/2" C.	LLNG	84	4#4/0, 1#4G., 2 1/2" C.	LLLNG
25	3#6, 3/4"C.	LLL	55	3#1, 1#6G., 1 1/2" C.	LLLG			
26	3#6, 1#10G., 3/4" C.	LLNG	56	4#1, 1#6G., 1 1/2" C.	LLLNG			
27	3#6, 1#10G., 3/4" C.	LLLG	57	2#1/0, 1 1/4" C.	LN			
28	4#6, 1#10G., 1" C.	LLLNG	58	2#1/0, 1#6G., 1 1/2" C.	LNG			
29	2#4, 3/4" C.	LN	59	2#1/0, 1#6G., 1 1/2"C.	LLG			
30	2#4, 1#8G., 1" C.	LNG	60	3#1/0, 1 1/2" C.	LLL			

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ESC-26

TRANSFORMER SCHEDULE

BASIS OF DESIGN
POWERSMITH E-SAVER (ALUMINUM)
REFERENCE SCHEDULE AND SPECIFICATIONS FOR PERFORMANCE, TESTING CRITERIA, AND ACCESSORIES (HINGED ACCESS DOORS, INTEGRAL SECONDARY BREAKERS, USB MONITORING, PERFORMANCE VERIFICATION TEST, ETC.)

GENERAL NOTES:

A. ALL FLOOR MOUNTED AND GROUND MOUNTED TRANSFORMERS SHALL HAVE A 3 1/2" CONCRETE PAD. COORDINATE CONCRETE WORK WITH GENERAL CONTRACTOR.

B. COORDINATE WALL HUNG AND/OR TRAPEZE HUNG TRANSFORMERS WITH STRUCTURAL ENGINEER AND ARCHITECT FOR BLOCKING AND STRUCTURAL SUPPORT.

C. PROVIDE PAD TYPE VIBRATION ISOLATORS FOR FLOOR, GROUND AND ROOF MOUNTED TRANSFORMERS. PROVIDE PAD TYPE AND SPRING TYPE VIBRATION ISOLATORS FOR HUNG AND WALL MOUNTED TRANSFORMERS.

D. ROOF MOUNTED TRANSFORMERS SHALL BE MOUNTED ON STRUCTURAL SUPPORTS OR RACK.

E. ALL CONDUCTORS/BREAKERS AND TERMINATIONS ARE BASED ON 75°C. RATING.

F. WHEN THE LENGTH OF THE SECONDARY CONDUCTORS OF ANY TRANSFORMER EXCEEDS TEN FEET, PROVIDE AN ENCLOSED CIRCUIT BREAKER OR FUSED DISCONNECT WITHIN TEN FEET OF THE TRANSFORMER SECONDARY TERMINALS IN ACCORDANCE WITH NEC ARTICLE 240.21(C)(2). THIS OVERCURRENT DEVICE SHALL HAVE AN AMP RATING EQUAL TO THE AMP RATING OF THE PANEL BEING SERVED. THE PANEL BEING FED MAY BE CHANGED TO MAIN LUG ONLY.

G. PROVIDE LUG KITS AND/OR WIRING GUTTERS FOR PANELS WITH OVERSIZED CONDUCTORS DUE TO VOLTAGE DROP AND/OR DISTANCE. MAKE CONNECTIONS IN ACCORDANCE WITH THE NEC.

H. PROVIDE SHOP DRAWINGS OF ALL ELECTRIC ROOMS INDICATING ALL PANEL, TRANSFORMER AND DISCONNECT LOCATIONS. ELECTRICAL EQUIPMENT MAY SHIFT IN LOCATION TO ENSURE PROPER CLEARANCES.

I. WIRE SIZES SHOWN ARE MINIMUMS. IF LARGER BREAKERS OR PANELS ARE LISTED IN PANEL SCHEDULES, LARGER WIRE SIZE AND QUANTITY RULES.

J. TRANSFORMERS NOT MEETING ENERGY, TESTING, METERING, BREAKER OPTIONS, HINGED ACCESS DOORS REQUIREMENTS WILL NOT BE CONSIDERED. REFERENCE SPECIFICATIONS.

KVA SIZE	PRIMARY				SECONDARY					MAXIMUM WEIGHT
	CIRCUIT BREAKER	WIRE	EQUIPMENT GROUNDING CONDUCTOR	CONDUIT	GROUNDING ELECTRODE CONDUCTOR	MAIN BONDING JUMPER	BREAKER/ FUSE	WIRE	EQUIPMENT GROUNDING CONDUCTOR	CONDUIT	
15	25	3 #10	#10	3/4"	#8	#8	60	4 #6	1 #10	1"	.
30	50	3 #8	#10	3/4"	#8	#8	100	4 #3	1 #8	1 1/4"	.
45	70	3 #4	#8	1"	#6	#6	150	4 #1/0	1 #6	1 1/2"	370
75	125	3 #1	#6	1 1/2"	#2	#2	225	4 #4/0	1 #4	2 1/2"	875
112.5	175	3 #2/0	#6	2"	#1/0	#1/0	400	4 #600	1 #1	4"	1100
150	225	3 #4/0	#4	2 1/2"	#2/0	#2/0	500	2 SETS (4#250kcm)	#2 (PER SET)	3" (PER SET)	1500
225	350	3 #400	#3	2 1/2"	#3/0	#3/0	800	2 SETS (4 #600KCM)	#1/0 (PER SET)	4" (PER SET)	1700
300	450	3 #600	#2	3"	#3/0	#3/0	1000/1000	3 SETS (4 #400KCM)	#2/0 (PER SET)	4" (PER SET)	2600
500	800	2 SETS (3 #500KCM)	#1/0 (PER SET)	3" (PER SET)	#3/0	300KCM	1600/1600	4 SETS (4 #600KCM)	#4/0 (PER SET)	4" (PER SET)	2100

* TRANSFORMER MUST MEET LISTED ENERGY RATING CRITERIA. PROVIDE A SUBMITTAL OF LOAD CURVE SHOWING LOADING AT 15%, 35%, 50%, 75% AND 100% WITH K-7 NON LINERAR LOADING PROFILE.
* TRANSFORMERS MUST MEET TESTING CRITERIA AND ALL OPTIONS SPECIFIED.

MARK	PRIMARY VOLTAGE: 240	480	KVA RATING: 1 PHASE	3 PHASE	15	30	45	75	112.5	150	225	300	500	SECONDARY VOLTAGE: 120/240	120/208	1 PHASE	3 PHASE	ENCL. TYPE: NEMA 1	NEMA 3R	W/ SECONDARY DISC.	W/ USB MONITOR	MOUNTING	REMARKS
T/LF1		○		○				○							○		○	○				PAD	.
.																						.	.

CIRCUIT BREAKER PANELBOARD ' LF1 '
WILLIAMSON COUNTY EXPO CENTER

STANDARD NOTES:
1. PROVIDE BALANCED LOAD ON EACH PHASE. CIRCUIT NUMBERS SHOWN ON DRAWINGS ARE FOR REFERENCE ONLY.
2. REFERENCE BRANCH CIRCUIT WIRE AND CONDUIT SCHEDULE.

NOTES:
(a) REFERENCE SPLIT SYSTEM / ROOFTOP ELECTRICAL CONNECTION SCHEDULE.
(b) REFERENCE TRANSFORMER SCHEDULE.
(c) REFERENCE FAN-POWERED BOX / VAV CONNECTION SCHEDULE.
(d) PROVIDE WITH SHUNT TRIP BREAKER.
(e) PROVIDE WITH INTEGRAL SURGE PROTECTION AND 200% NEUTRAL.
(f) PROVIDE WITH GFCI BREAKER.
(g) REFERENCE ASSOCIATED PANEL SCHEDULE.
(h) PROVIDE 6" PANEL EXTENSION AND CT'S AS NOTED.

120/208 VOLT, 3 PHASE, 4 WIRE, 225 A. MCB, KA. RMS SYM.
SURFACE MOUNTED, NEMA 1 ENCLOSURE, S/N
FEEDER: REFERENCE PANELBOARD CONNECTION SCHEDULE

CKT		LOAD DESCRIPTION	WIRE/CONDUIT	KVA	C/B	C/B	KVA	WIRE/CONDUIT	LOAD DESCRIPTION		CKT
1	E	HAND DRYER	2	1.5	20/1	20/1	1.5	2	GRIDDLE (d)	E	2
3	E	HAND DRYER	2	1.5	20/1	20/1	1.5	2	SPARE	S	4
5	E	HAND DRYER	2	1.5	20/1	20/1	1.5	2	REFRIGERATOR	E	6
7	E	HAND DRYER	2	1.5	20/1	20/1	1.5	2	CONCESSION RECEPTACLES	E	8
9	E	EWC	2	1.0	20/1	20/1	1.5	2	ICE MAKER	E	10
11	E	WHSP	2	1.7	20/1	20/1	1.5	2	MICROWAVE	E	12
13	E	GAS DEEP FRYER (d)	2	1.5	20/1	20/1	1.5	2	GAS DEEP FRYER (d)	E	14
15	R	RECEPTACLES	2	0.5	20/1	20/1	1.5	2	CONCESSION RECEPTACLES	R	16
17	R	EXTERIOR RECEPTACLES	2	1.5	20/1	20/1	1.5	2	MICROWAVE	E	18
19	R	EXTERIOR RECEPTACLES	2	1.5	20/1	20/1	1.5	2	DISPLAY COOLER	E	20
21	R	EXTERIOR RECEPTACLES	2	1.5	20/1	20/1	0.5	2	DELUXE WARMER	E	22
23	R	EXTERIOR RECEPTACLES	2	1.5	20/1	20/1	0.5	2	COUNTER WARMER	E	24
25	R	EXTERIOR RECEPTACLES	2	1.5	20/1	20/1	0.5	2	HOT TOPPING SERVER	E	26
27	R	EXTERIOR RECEPTACLES	2	1.5	20/1	20/1	1.0	2	ROLLER GRILL	E	28
29	E	EF-1F1	2	0.7	20/1	20/1	0.5	2	HEAT LAMP FOOD WARMER	E	30
31	E	EF-2F1	2	0.5	20/1	20/1	0.5	2	HEAT LAMP FOOD WARMER	E	32
33	E	EF-3F1	2	1.9	20/1	20/1	1.8	2	POPCORN MACHINE	E	34
35	E	KEF-1F1	2	1.2	20/1	20/1	1.2	2	KSF-1F1	E	36
37	E	CF-1F1, 4F1	2	1.4	20/1	20/1	0.5	2	TV MONITORS	E	38
39	E	CF-2F1, 3F1	2	1.4	20/1	20/1	1.5	2	COUNTER WARMER	E	40
41	R	RECEPTACLES	2	0.5	20/1	20/1	0.5	2	EXHAUST HOOD	E	42
43	E	DDC CONTROLS	2	0.5	20/1	20/1	1.5	2	DISPLAY COOLER	E	44
45	R	RECEPTACLES	2	0.5	20/1	20/1	0.5	2	RECEPTACLES	R	46
47	E	FUTURE FANS	2	0.7	20/1	20/1	0.5	2	RECEPTACLES	R	48
49	E	FUTURE FANS	2	0.7	20/1	20/1	0.5	2	RECEPTACLES	R	50
51	S	SPARE	--	--	20/1	20/1	0.5	2	RECEPTACLES	R	52
53	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	54
55	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	56
57	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	58
59	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	60
61	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	62
63	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	64
65	S	SPACE	--	--	--	--	--	--	SPACE	S	66
67	S	SPACE	--	--	--	--	--	--	SPACE	S	68
69	S	SPACE	--	--	--	--	--	--	SPACE	S	70
71	S	SPACE	--	--	--	--	--	--	SPACE	S	72
73	S	SPACE	--	--	--	--	--	--	SPACE	S	74
75	S	SPACE	--	--	--	--	--	--	SPACE	S	76
77	S	SPACE	--	--	--	--	--	--	SPACE	S	78
79	S	SPACE	--	--	--	--	--	--	SPACE	S	80
81	S	SPACE	--	--	--	--	--	--	SPACE	S	82
83	S	SPACE	--	--	--	--	--	--	SPACE	S	84

ELECTRICAL LOAD CALCULATIONS:

CONNECTED LOAD			DEMAND FACTOR	DEMAND LOAD			REMARKS:
LIGHTING	=	0.0 KVA	X 1.25	LIGHTING	=	0.0 KVA	
RECEPTACLE	=	14.0 KVA	NEC 220 - 13	RECEPTACLE	=	12.0 KVA	
EQUIPMENT	=	42.7 KVA	X 1.0	EQUIPMENT	=	42.7 KVA	
KITCHEN	=	0.0 KVA	NEC 220 - 20	KITCHEN	=	0.0 KVA	
SPARES	=	1.5 KVA	X 0.5	SPARES	=	0.8 KVA	
TOTAL	=	58.2 KVA		TOTAL	=	55.5 KVA	154 AMPS

CIRCUIT BREAKER PANELBOARD ' HF1 '
WILLIAMSON COUNTY EXPO CENTER

STANDARD NOTES:
1. PROVIDE BALANCED LOAD ON EACH PHASE. CIRCUIT NUMBERS SHOWN ON DRAWINGS ARE FOR REFERENCE ONLY.
2. REFERENCE BRANCH CIRCUIT WIRE AND CONDUIT SCHEDULE.

NOTES:
(a) REFERENCE SPLIT SYSTEM / ROOFTOP ELECTRICAL CONNECTION SCHEDULE.
(b) REFERENCE TRANSFORMER SCHEDULE.
(c) REFERENCE FAN-POWERED BOX / VAV CONNECTION SCHEDULE.
(d) PROVIDE WITH SHUNT TRIP BREAKER.
(e) PROVIDE WITH INTEGRAL SURGE PROTECTION AND 200% NEUTRAL.
(f) PROVIDE WITH GFCI BREAKER.
(g) REFERENCE ASSOCIATED PANEL SCHEDULE.
(h) PROVIDE 6" PANEL EXTENSION AND CT'S AS NOTED.

277/480 VOLT, 3 PHASE, 4 WIRE, 225 A. MCB, KA. RMS SYM.
SURFACE MOUNTED, NEMA 1 ENCLOSURE, S/N
FEEDER: REFERENCE PANELBOARD CONNECTION SCHEDULE

CKT		LOAD DESCRIPTION	WIRE/CONDUIT	KVA	C/B	C/B	KVA	WIRE/CONDUIT	LOAD DESCRIPTION		CKT
1	L	LIGHTING - INTERIOR	2	3.0	20/1	20/1	2.5	2	COVE HEATERS	E	2
3	L	LIGHTING - EXTERIOR	2	3.0	20/1	20/1	2.5	2	COVE HEATERS	E	4
5	S	SPARE	2	3.0	20/1	20/1	3.0	2	COVE HEATERS	E	6
7	E	COVE HEATERS	2	3.0	20/1	20/1	3.6	2	ELH-1F1	E	8
9	E	COVE HEATERS	2	2.5	20/1	20/1	3.6	2	ELH-2F1	E	10
11	S	SPARE	--	1.0	20/1	20/1	3.3	2	ELH-3F1	E	12
13	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	14
15	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	16
17	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	18
19	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	20
21	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	22
23	S	SPARE	--	--	20/1	20/1	--	--	SPARE	S	24
25	S	SPACE	--	--	--	--	--	--	SPACE	S	26
27	S	SPACE	--	--	--	--	--	--	SPACE	S	28
29	S	SPACE	--	--	--	--	--	--	SPACE	S	30
31	S	SPACE	--	--	--	--	--	--	SPACE	S	32
33	S	SPACE	--	--	--	--	--	--	SPACE	S	34
35	S	SPACE	--	--	--	--	--	--	SPACE	S	36
37	S	SPACE	--	--	--	125/3	55.0	(b)	TRANSFORMER T/LF1	E	38
39	S	SPACE	--	--	--	--	--	--	" "		40
41	S	SPACE	--	--	--	--	--	--	" "		42

ELECTRICAL LOAD CALCULATIONS:

CONNECTED LOAD			DEMAND FACTOR	DEMAND LOAD			REMARKS:
LIGHTING	=	6.0 KVA	X 1.25	LIGHTING	=	7.5 KVA	
RECEPTACLE	=	0.0 KVA	NEC 220 - 13	RECEPTACLE	=	0.0 KVA	
EQUIPMENT	=	79.0 KVA	X 1.0	EQUIPMENT	=	79.0 KVA	
KITCHEN	=	0.0 KVA	NEC 220 - 20	KITCHEN	=	0.0 KVA	
SPARES	=	4.0 KVA	X 0.5	SPARES	=	2.0 KVA	
TOTAL	=	89.0 KVA		TOTAL	=	88.5 KVA	107 AMPS

THE ELECTRICAL RISER DIAGRAM IS SHOWN SCHEMATICALLY IN NATURE TO INDICATE THE RELATIONSHIP OF THE ELECTRICAL SYSTEM COMPONENTS. IT DOES NOT REFLECT THE ACTUAL ROUTING OF CONDUITS. CONTRACTOR SHALL DETERMINE OVERHEAD OR UNDERGROUND CONDUIT ROUTING. CONDUIT SHALL NOT BE ROUTED EXPOSED ON EXTERIOR WALLS EXCEPT OUT OF THE BOTTOM OF THE PANEL TO RUN UNDER SLAB OR TO AN ADJACENT PANEL WITHIN 24". EXTERIOR EXPOSED CONDUIT SHALL BE MINIMIZED.

GEAR MANUFACTURER TO PROVIDE COORDINATION STUDY, FAULT CURRENT ANALYSIS, ARC FLASH ANALYSIS, AND DETERMINE FINAL KAIC/ARC FLASH RATINGS FOR ALL GEAR.

ESC-01-NLIGHT

NLIGHT - DEVICE SYMBOL SCHEDULE

NOTES:
A. ALL SYMBOLS DO NOT NECESSARILY APPEAR ON THESE DRAWINGS.
B. ALL DEVICE PART NUMBERS ARE NLIGHT UNLESS OTHERWISE NOTED.
C. THESE DEVICES SHOULD BE USED IN ALL AREAS TO BE CONTROLLED BY NLIGHT.
D. MOTION SENSOR: WHERE MOTION SENSORS ARE SHOWN ON THE PLANS, THAT INDICATES AREA SHOULD BE COVERED IN FULL BY MOTION SENSORS. IT IS UP TO MOTION SENSOR PROVIDER TO PROVIDE APPROPRIATE QUANTITY, LAYOUT, AND TYPE OF MOTION SENSORS FOR COMPLETE COVERAGE. PROVIDE SHOP DRAWING AT SUBMITTAL PHASE.
E. PHOTOCELL: WHERE PHOTOCELLS ARE SHOWN ON PLANS OR IN TYPICAL DETAILS, IE:CLASSROOMS, PHOTOCELL LOCATION AND QUANTITY SHOULD BE DETERMINED BY PHOTOCELL PROVIDER. PHOTOCELLS ARE INTENDED TO DIM LIGHTS IN DAYLIGHT ZONES AS INDICATED BY IECC 2015.
F. IF MULTIPLE ZONE CONTROL IS INDICATED FOR A SPACE AND THOSE ZONES ARE NOT CLEAR TO CONTRACTOR, THE CONTRACTOR IS TO MAKE BEST ASSUMPTION IN SHOP DRAWING PHASE AND NOTE AREAS IN QUESTION. ENGINEER WILL REVIEW AND MAKE ANY ADJUSTMENTS TO ZONES AT THAT TIME.
G. MANUFACTURER TO PROVIDE A COMPLETE SET OF SHOP DRAWINGS INDICATING ALL ASPECTS OF LIGHTING CONTROL AT A MINIMUM OF 1/8" = 1' SCALE WITH CLEAR DESCRIPTIONS AND LEGENDS FOR SYMBOLS.
H. BASIC COMPONENTS ARE CALLED FOR HERE. IT IS EXPECTED THAT MANUFACTURER PROVIDES ALL COMPONENTS FOR A COMPLETE WORKABLE SYSTEM.
I. FACTORY START-UP IS REQUIRED FOR ALL NLIGHT SPACES.
J. CONTRACTOR SHOULD SEND COMPLETE SET OF ELECTRICAL PLANS TO NLIGHT FACTORY REP TO ENSURE A COMPLETE BID.
K. CONTRACTOR TO ASSUME ALL DEVICES INTER-CONNECTED WITH CAT-5 CABLE. PROVIDE ALL REQUIRED CABLING BETWEEN DEVICES.

SYMBOL	DESCRIPTION	REMARKS
S^{D2}	DUAL TECHNOLOGY WALL MOUNT MOTION AND DIMMING	nWSX-PDT-D-SA
S^{C1}	ONE ZONE CONTROLLER, ON/OFF AND DIMMING	nPODM-DX
S^{C2}	TWO ZONE CONTROLLER, ON/OFF AND DIMMING	nPODM-2P-DX
S^{C4}	FOUR ZONE CONTROLLER, 4 PRESET TOGGLE BUTTONS	nPODm-4S-DX
S^{K}	ONE ZONE KEYED CONTROLLER, ON/OFF AND DIMMING	nPOD-KEY
S^{C3}	COLOR SCENE CONTROLLER	nPODM-4S-EDUTW
M_{DT}	MOTION SENSOR, DT (DUAL TECHNOLOGY)	nCM-PDT-9
M_{DT}	MOTION SENSOR, DT (DUAL TECHNOLOGY)	nCM-PDT-10
M_{DT}	MOTION SENSOR, DT (DUAL TECHNOLOGY)	nWV-PDT-16
Ⓟ	PHOTOCELL	nCM-ADCX
		-

NLIGHT INTERIOR LIGHTING SCHEDULE

GENERAL NOTES:

POWER PACKS
FOR FIXTURES THAT ARE NOT NLIGHT COMPATIBLE, PROVIDE POWER PACKS TO ACHIEVE ZONING INDICATED ON PLANS.

AREAS WITH HIGH CEILINGS (25FT OR HIGHER). PROVIDE POWER PACKS TO ACHIEVE ZONING INDICATED ON PLANS. LOCATE POWER PACKS IN ACCESSIBLE LOCATION FROM LIGHTING PANEL SERVING CIRCUITS.

WHEN POWER PACKS ARE PROVIDED. CONTRACTOR MUST PROVIDE 0-10V DIMMING WIRES FROM POWER PACK TO FIXTURE FOR CONTROL IN LIEU OF CAT5 CABLE.

NLIGHT MANUFACTURER TO PROVIDE NLIGHT ENABLED FIXTURES OR POWER PACKS TO ACHIEVE ZONING SHOWN ON PLANS FOR SWITCHING AND DAYLIGHT ZONES TO PROVIDE BEST VALUE TO THE PROJECT.

MOTION SENSORS
PROVIDE COMPLETE MOTION SENSOR COVERAGE FOR ENTIRE BUILDING, EXCEPT ELECTRIC ROOMS, AND AS WHEN NOTED EXCEPTION SHOWN ON PLANS. PROVIDE DUAL TECHNOLOGY MOTION SENSORS IN EVERY ROOM AS REQUIRED BY IECC 2015. ASSUME CEILING MOUNT UNLESS WALL MOUNT SHOWN.

VACANCY SENSORS
PROVIDE COMPLETE DUAL TECHNOLOGY VACANCY SENSOR COVERAGE PER IECC 2015 IN ALL AREAS EXCEPT EMERGENCY EGRESS CORRIDORS AND PATHWAYS. SHOP DRAWING REQUIRED.

OCCUPANCY SENSORS
PROVIDE COMPLETE DUAL TECHNOLOGY OCCUPANCY SENSOR COVERAGE PER IECC 2015 IN ALL EMERGENCY EGRESS CORRIDORS AND PATHWAYS. SHOP DRAWING REQUIRED.

CONTROL STATION
ALL ROOMS SHALL HAVE A CONTROL STATION FOR CONTROL OF LIGHTS IN ROOM. IF NO CONTROL STATION IS SHOWN, ASSUME A TWO ZONE CONTROLLER FOR ROOMS LARGER THAN 9' X 9' AND A WALL MOUNT DUAL TECHNOLOGY CONTROLLER FOR ROOMS SMALLER THAN 9' X 9'.

SPACE TYPE DESCRIPTION:

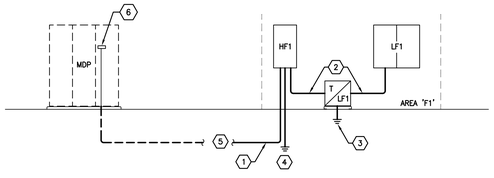
CONCESSION
A. PROVIDE CONTROL STATIONS AS SHOWN ON PLANS.
B. TWO (2) BUTTON ZONE CONTROL. ZONE 'a' - SERVING AREA, ZONE 'b' COOKING AREA.
C. LIGHTS SHALL BE MANUAL ON/MANUAL OFF ONLY.
D. NO PHOTOCELL CONTROL.

GANG RESTROOMS
A. PROVIDE ON/OFF CONTROL STATIONS AS SHOWN ON PLANS.
B. PROVIDE COMPLETE MOTION SENSOR COVERAGE FOR MAJOR MOVEMENTS. AUTO ON. WHEN NO MOTION IS DETECTED AFTER 15 MINUTES, LIGHTS SHALL BE DIMMED TO 10%. IF NO ADDITIONAL MOTION IS DETECTED AFTER 30 MINUTES, LIGHTS SHALL POWER OFF.
C. PROVIDE NLIGHT PLUG LOAD POWER PACK (nPP20 PL) IN ACCESSIBLE LOCATION FOR EXHAUST FAN CONTROL.

SINGLE ZONE ROOMS
A. PROVIDE CONTROL STATIONS AS SHOWN ON PLANS.
B. ONE OVERALL ZONE TO CONTROL ALL LIGHTS IN ROOM.
C. PROVIDE COMPLETE MOTION SENSOR COVERAGE FOR MINOR MOVEMENTS, MANUAL ON / AUTO OFF. SHOP DRAWING REQUIRED.
a. PROVIDE NLIGHT PLUG LOAD POWER PACK (nPP20 PL) IN ACCESSIBLE LOCATION FOR EXHAUST FAN CONTROL IN SINGLE RESTROOMS.

RISER KEYED NOTES

1. REFERENCE PANELBOARD CONNECTION SCHEDULE FOR CONDUIT/WIRING SIZES AND QUANTITIES.
2. REFERENCE TRANSFORMER SCHEDULE FOR CONDUIT/WIRING SIZES AND QUANTITIES.
3. REFERENCE TRANSFORMER GROUNDING DETAIL FOR GROUNDING REQUIREMENTS.
4. PROVIDE GROUND BAR OR EUPHER GROUND. CONNECT TO GROUND BAR ONLY. REFERENCE REMOTE BUILDING REQUIREMENTS, NEC 250-32.
5. EXTEND EXISTING CONDUIT STUB TO ELECTRICAL ROOM. REFERENCE SITE PLAN.
6. FEED FROM SPARE 225A/3P BREAKER IN 'MDP'



01 RISER DIAGRAM - ELECTRICAL
SCALE: NONE

LIGHT FIXTURE SCHEDULE

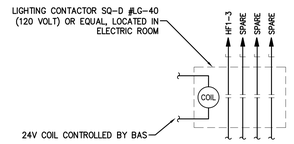
GENERAL NOTES:
A. CONFIRM CEILING TYPE AND CONSTRUCTION PRIOR TO ORDERING LIGHT FIXTURE. PROVIDE FLANGE KIT FOR PROPER INSTALLATION OF LAY-IN FIXTURE IN GYPSUM CEILING. PROVIDE FIXTURE TYPE 'H2' IN LIEU OF FIXTURE TYP 'A2' IN ROOMS WITH NO CEILING. CHAIN HANG AT 10' A.F.F.
B. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF WALL MOUNTED LIGHT FIXTURES WITH ARCHITECT PRIOR TO ROUGH-IN.
C. REFER TO ARCHITECTURAL REFLECTIVE CEILING PLAN FOR EXACT LOCATION OF LIGHT FIXTURE.
D. CONFIRM FINISH WITH ARCHITECT PRIOR TO ORDERING LIGHT FIXTURES.
E. 'E' DESIGNATION ADJACENT TO LIGHTING FIXTURE TYPE INDICATES FIXTURE SHALL BE PROVIDED WITH EMERGENCY BATTERY PACK UNIT (LITHONIA PS1400 OR EQUAL). LIGHT FIXTURE SHALL BE SWITCHED, BATTERY PACK SHALL BE UNSWITCHED.
F. 'N' DESIGNATION ADJACENT TO LIGHTING FIXTURE TYPE INDICATES FIXTURE SHALL BE PROVIDED WITH EMERGENCY BATTERY PACK UNIT (LITHONIA PS1400 OR EQUAL). LIGHT FIXTURE AND BATTERY PACK SHALL BE UNSWITCHED.
G. FIXTURES SHALL HAVE A MAXIMUM OF TWO (2) LAMPS PER BALLAST.
H. CONNECT ALL EXIT LIGHTING TO THE NEAREST UNSWITCHED CIRCUIT OR THE NEAREST EMERGENCY CIRCUIT.
I. REFERENCE 'NLIGHT DEVICE SYMBOL SCHEDULE' AND 'NLIGHT INTERIOR LIGHTING SCHEDULE'.
(*) PROVIDE UNIT PRICE FOR THIS FIXTURE. INCLUDE MATERIAL AND LABOR TO BE ADDED AT ANY TIME DURING THE PROJECT.

MARK	MANUFACTURERS CATALOG NUMBER	LAMPS NO. / TYPE / WATTS	FIXTURE VOLTS / WATTS	DESCRIPTION AND COMMENTS
A5	LITHONIA 2GTL-4-60L-A12INVC-MVOLT-LP835-ABC-EZ1-N100	1/LED 6000 LUMENS/59	MVOLT/59	PRISMATIC 2 x 4 LAY IN LED, WHITE FINISH. 1%DIMMING, NLIGHT, GASKETED DOOR, INVERT LENS FOR KITCHEN AREAS..GRID CLG
H2	LITHONIA CLX-L48-5000LM-SEF-FDL MVOLT-EZ1-35K-80CRI-WH	1/LED 4725 LUMENS/41	MVOLT/41	LED STRIP FIXTURE. CHAIN HANG, AIRCRAFT CABLE OR SURFACE MOUNT DEPENDING ON APPLICATION. TYPICAL MOUNTING HEIGHT APPROX 8'-12'. 1%DIMMING, NLIGHT
J2	KENALL-MELLENIUM STRETCH MLHA5-48-SP-MW-PP -45L35K-DV-DL	1/LED 4200L/61	MVOLT/45	ENCLOSED LED WET LOCATION STRIP WITH ENERGY SAVING LAMPS. HIGH IMPACT LENS. WHITE FINISH. WHEN WALL MOUNTED IN BATHROOMS MOUNT 6" ABOVE PARTITIONS AND MIRRORS.
T1	VISIONAIRE LIGHTING VSC-1-T2-32-530-4000K-UNV-WM-SL-PC120	1/LED ENGINES/54	MVOLT/54	ARCHITECTURAL WALL MOUNTED LED FIXTURE WITH DIE CAST ALUMINUM HOUSING, ALUMINUM REFLECTOR WITH FULL CUT-OFF, HIGH EFFICIENCY DRIVER. SILVER FINISH. COORDINATE FINAL HEIGHT WITH ARCHITECTURAL.
T5	VISIONAIRE LIGHTING VSC-1-T2-16-530-4000K-UNV-WM-SL-PC120	1/LED ENGINES/27	MVOLT/27	ARCHITECTURAL WALL MOUNTED LED FIXTURE WITH DIE CAST ALUMINUM HOUSING, ALUMINUM REFLECTOR WITH FULL CUT-OFF, HIGH EFFICIENCY DRIVER. SILVER FINISH. OVER DOOR OR TO SIDE OF DOOR AS SHOWN ON PLANS. COORDINATE FINAL HEIGHT WITH ARCHITECTURAL. PROVIDE WITH EMERGENCY BALLAST.
X1	LITHONIA LESW-1R-277-ELN	INCLUDED	277/5	LED SINGLE FACE EXIT SIGN WITH DIE CAST ALUMINUM HOUSING, EMERGENCY BATTERY PACK. WHITE FINISH.
Y1	LITHONIA ELM2-LED	INCLUDED	277/20	EMERGENCY EGRESS FIXTURE WITH POLYCARBONATE HOUSING, EMERGENCY BATTERY PACK AND AMMETER. WHITE FINISH. MOUNT FIXTURE ON WALL, AS HIGH AS POSSIBLE. CONNECT TO NEAREST UNSWITCHED 277 VOLT CIRCUIT.

OSCILLATING WALL FANS

CIRCULATING FAN (CF-XXX):
DAYTON, TWO SPEED, OSCILLATING WALL FAN. PROVIDE WITH SUITABLE WALL BRACKET FOR OSCILLATING FANS. (QUANTITY PER PLANS)

MARK NO.	STOCK/ MODEL NUMBER	CFM	HP	VOLT/PH	BLADE DIAMETER	OSCILLATING
CF-XXX	1VCF2	4700/3055	1/4	120/1	20"	YES



LIGHTING CONTACTOR DETAIL
SCALE: NONE

EDE-11

PROJECT NORTH NORTH

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300 Wyandotte, Suite 200
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WILLIAMSON COUNTY EXPO
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5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

STATE OF TEXAS — B. J. HENDRIX — 94813 — LICENSED PROFESSIONAL ENGINEER

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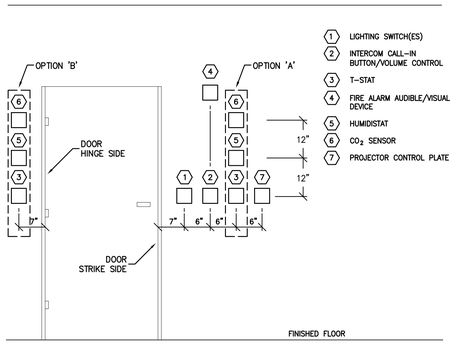
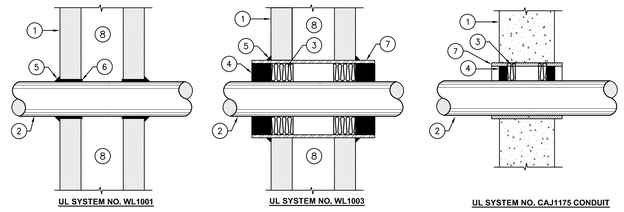


NOTES:

1. **THE PURPOSE OF THIS DETAIL IS TO SET A STANDARD FOR DEVICE ROUGH-IN. ADJUSTMENT FOR FIELD CONDITIONS WILL BE ALLOWED.**
2. **PROVIDE HORIZONTAL MULTI-DEVICE BRACKET AS REQUIRED.**
3. **MARKER BOARD IN CLASSROOMS SHOULD BE 30" FROM DOOR TO ALLOW ALL DEVICES TO BE ROUGHED-IN PER DETAIL.**
4. **MECHANICAL CONTROL DEVICES MAY BE ON EITHER SIDE OF DOOR, DEPENDING ON JOB CONDITIONS. REFERENCE OPTION 'A' AND OPTION 'B'. T-STAT MAY NOT BE BEHIND DOOR WHEN OPEN.**

TYPICAL DEVICE OUTLET LOCATIONS ADJACENT TO DOORS

NO SCALE EDE-91



KEYED NOTES

1. RATED WALL BARRIER
2. PIPE OR CONDUIT
3. FORMING MATERIAL (MINERAL - WOOL BATT INSULATION
4. FIRE CAULK
5. FIRE CAULK - CONTINUOUS BEAD AROUND PENETRATING ITEM
6. FIRE CAULK - CONTINUOUSLY FILL ANNULAR SPACE BETWEEN PIPE OR CONDUIT THROUGHOUT THICKNESS OF WALL BOARD LAYERS
7. SLEEVE FOR UL SYSTEM NO. WL1003, OPTIONAL FOR UL SYSTEM NO. CAJ1175
8. WALL CAVITY

GENERAL NOTES

A. REFERENCE ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF ALL RATED WALLS, FLOORS AND CEILINGS.

B. REFERENCE SPECIFICATIONS FOR ADDITIONAL INFORMATION CONCERNING MATERIALS AND METHODS.

C. REFERENCE UL FIRE RESISTANCE DIRECTORY FOR ADDITIONAL DATA, INCLUDING WALL RATINGS FOR WHICH DETAILS ARE AND SUPPORT REQUIREMENTS.

D. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH UL SYSTEM NUMBER AND MANUFACTURER'S INSTRUCTIONS PROVIDED WITH MATERIALS.

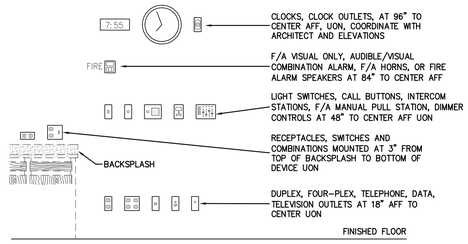
E. ONLY MATERIALS TESTED FOR SPECIFIC UL SYSTEM NUMBER MAY BE USED.

F. ANNULAR SPACE BETWEEN FIRE BARRIER SURFACE AND PENETRATING ITEM IS EXTREMELY CRITICAL. REFER TO PARTICULAR UL SYSTEM NUMBER AND FIRE RATING FOR THIS CRITERIA.

TYPICAL CONDUIT PENETRATION

NO SCALE (FIRE RATED GYPSUM/STUD WALL ASSEMBLY AND CONCRETE WALL/FLOOR ASSEMBLY)

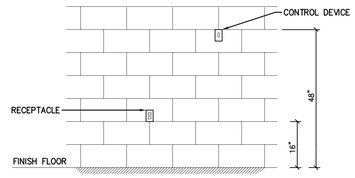
EDE-96



MOUNTING HEIGHT DETAIL

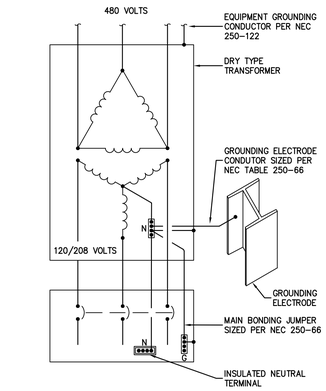
NO SCALE EDE-10

DEVICE IN CMU WALLS SHALL BE INSTALLED TO AVOID SPLITTING JOINTS AS SHOWN. ALL DEVICES MUST MEET ADA REQUIREMENTS, (48" MAXIMUM TO CENTER OF CONTROL DEVICES AND 16" MINIMUM TO CENTER OF RECEPTACLES).



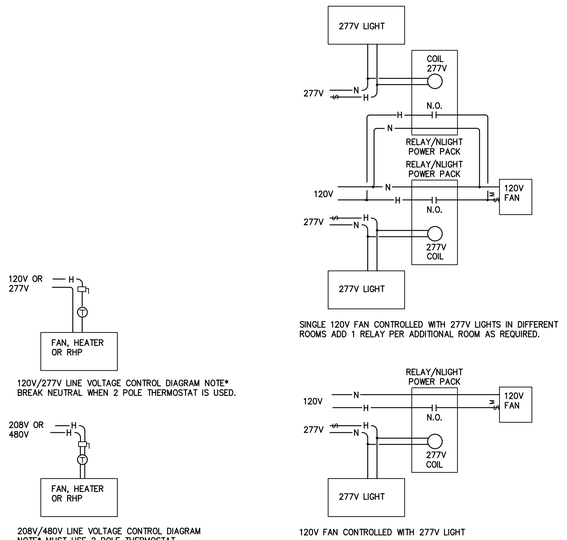
CMU DEVICE DETAIL

NO SCALE EDE-59



TRANSFORMER GROUNDING DETAIL

SCALE: NO SCALE EDE-55



SINGLE 120V FAN CONTROLLED WITH 277V LIGHTS IN DIFFERENT ROOMS ADD 1 RELAY PER ADDITIONAL ROOM AS REQUIRED.

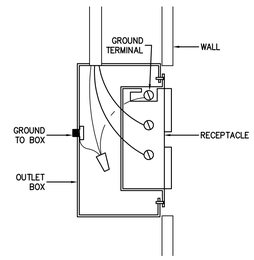
120V/277V LINE VOLTAGE CONTROL DIAGRAM NOTE* BREAK NEUTRAL WHEN 2 POLE THERMOSTAT IS USED.

208V/480V LINE VOLTAGE CONTROL DIAGRAM NOTE* MUST USE 2 POLE THERMOSTAT.

120V FAN CONTROLLED WITH 277V LIGHT

EXHAUST FAN/HEATER CONTROL

SCALE: NONE EDE-90



RECEPTACLE GROUNDING DETAIL

NO SCALE EDE-57

PROJECT NORTH NORTH

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WILLIAMSON COUNTY EXPO EAST CONCESSION & RESTROOM

5350 Bill Pickett Trail
Taylor, Texas 76574

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

STATE OF TEXAS
BY HENDRIX
94813
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY BY HENDRIX, NO. 94813 ON: 01/11/2019

REFERENCE GENERAL NOTES ON SHEETS M1.3, P1.1, AND E1.1 FOR ADDITIONAL INFORMATION

HENDRIX CONSULTING ENGINEERS

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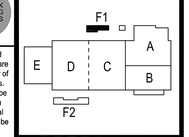
HCE job no.: 19-003



PROJECT NO. 14.3903 ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE:

DETAILS - ELECTRICAL

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

E1-3

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03 EXAMPLE OF LIGHT AND HEATER SPACING
SCALE: NTS

COORDINATE ALL ROUGH-IN, CONNECTION REQUIREMENTS AND ADDITIONAL ELECTRICAL REQUIREMENTS WITH KITCHEN CONSULTANT DRAWINGS.

PROVIDE SHUNT TRIP PROTECTION FOR ALL EQUIPMENT UNDER EXHAUST HOODS.

ALL 120 VOLT RECEPTACLES IN KITCHEN TO BE GFCI TYPE PER 210.8.(B).(2).

REFER TO FOOD SERVICES DRAWINGS FOR ROUGH-IN REQUIREMENTS AND EQUIPMENT INFORMATION.

KITCHEN ELECTRICAL NOTES

(A) ELECTRICIAN TO COORDINATE ALL ROUGH-IN, CONNECTION REQUIREMENTS AND ADDITIONAL ELECTRICAL REQUIREMENTS WITH ACTUAL EQUIPMENT TO BE INSTALLED.

B KITCHEN HOOD: THE ELECTRICIAN SHALL PROVIDE ALL NECESSARY HARDWARE, WIRING AND MAKE ALL CONNECTIONS FOR KITCHEN HOOD LIGHTS, FAN, FAN INTERLOCKS, SHUNT CONNECTIONS, INTERLOCKS ETC.

C THE KITCHEN EQUIPMENT SUPPLIER IS TO PROVIDE CORD AND PLUG SET TO THE ELECTRICIAN. THE ELECTRICIAN SHALL INSTALL CORD AND PLUG AND PROPER RECEPTACLE TO MATCH. FOR LARGE PIECES WHEN THIS ISN'T PROVIDED THE ELECTRICIAN IT TO PROVIDE NEC DISCONNECTING MEANS RECEPTACLE OR DISCONNECT PER OWNER REQUIREMENTS. (3PH-208V GEAR)

D ALL 120 VOLT RECEPTACLES IN KITCHEN TO BE GFCI PER NEC 210.8.(B).(2). GFCI BREAKERS ARE TO SERVE CIRCUITS TO EQUIPMENT WHERE GFCI RECEPTACLES ARE NOT ACCESSIBLE TO RESET

E COORDINATE LOCATION OF GFI RECEPTACLE SO THEY ARE ACCESSIBLE TO BE RESET.

F PROVIDE DATA OUTLET UNDER EACH CASH REGISTER. COORDINATE FINAL LOCATION WITH KITCHEN PLANS.

KEYED NOTES

THESE NOTES APPLY TO THIS SHEET ONLY

(1) COORDINATE FINAL RECEPTACLE LOCATIONS WITH MILLWORK PRIOR TO ROUGH-IN.

2 ROUGH-IN JUNCTION BOX AND STUB 3/4" CONDUIT THRU WALL TO ABOVE CEILING FOR FUTURE CCTV CAMERA LOCATION. MOUNT 12'-0" A.F.F.. VERIFY WITH CCTV CONTRACTOR IF AVAILABLE FOR FINAL LOCATION AND MOUNTING HEIGHT PRIOR TO ROUGH-IN. PROVIDE BLANK WP PLATE AND PULL STRING.

3 GFI RECEPTACLE FOR POWER BEHIND EWC. COORDINATE FINAL ROUGH-IN LOCATION.

4 COORDINATE ALL FINAL EXTERIOR LIGHT ELEVATIONS/LOCATIONS WITH ARCHITECT PRIOR TO ROUGH-IN.

5 IN BATHROOM, COORDINATE FIXTURE ELEVATIONS WITH BATHROOM PARTITIONS AND MIRRORS. APPROXIMATELY 24" ABOVE PARTITIONS. REFER TO DETAIL 03. ALIGN J-BOX WITH TOP OR BOTTOM OF CMU BLOCK.

6 PROVIDE LIGHTING CONTACTOR FOR EXTERIOR LIGHTING CONTROL. REFERENCE LIGHTING CONTACTOR DETAIL. COORDINATE WITH CONTROLS CONTRACTOR.

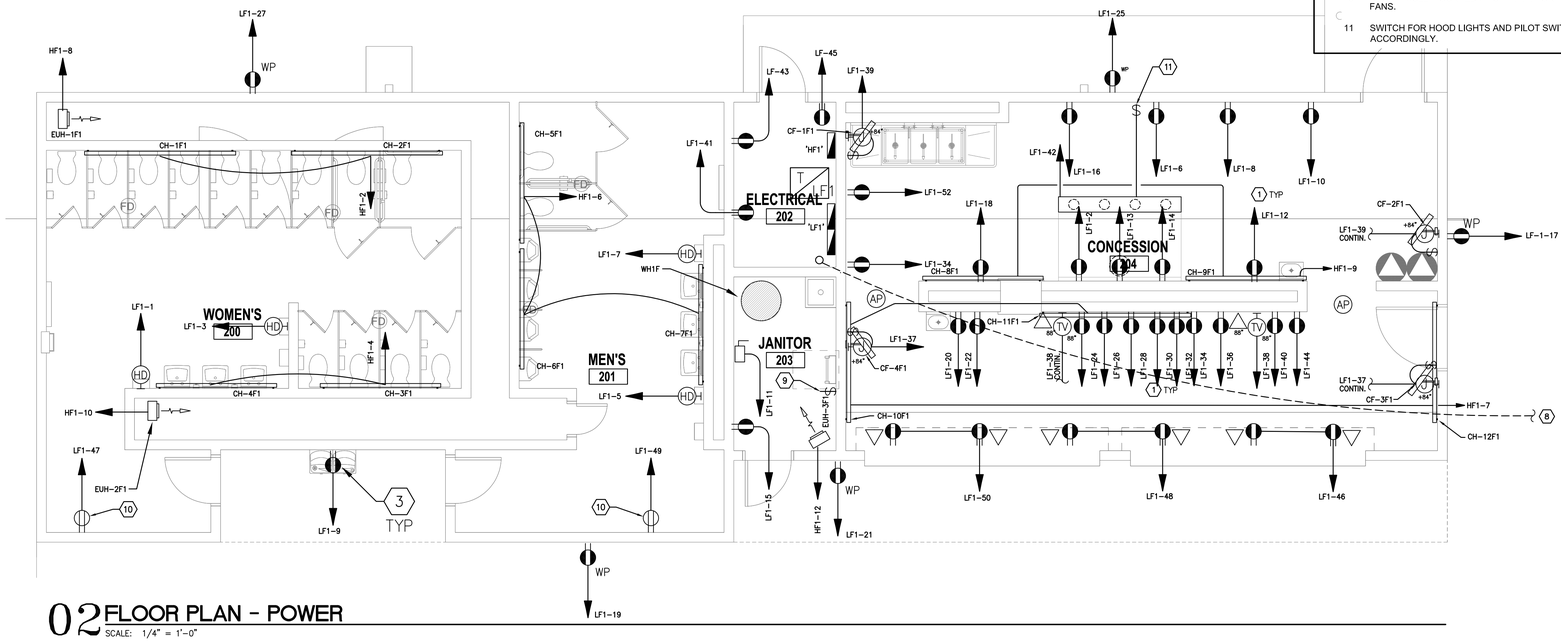
7 EXTERIOR LIGHTS RUN THROUGH LIGHTING CONTACTOR CONTROLLED BY BAS CONTROLS.

8 (1) 2 1/2"C FOR FEEDER CABLE AND (1) 1"C FOR SPECIAL SYSTEMS. EXTEND EXISTING STUB. REFER TO SITE PLAN FOR ADDITIONAL INFORMATION.

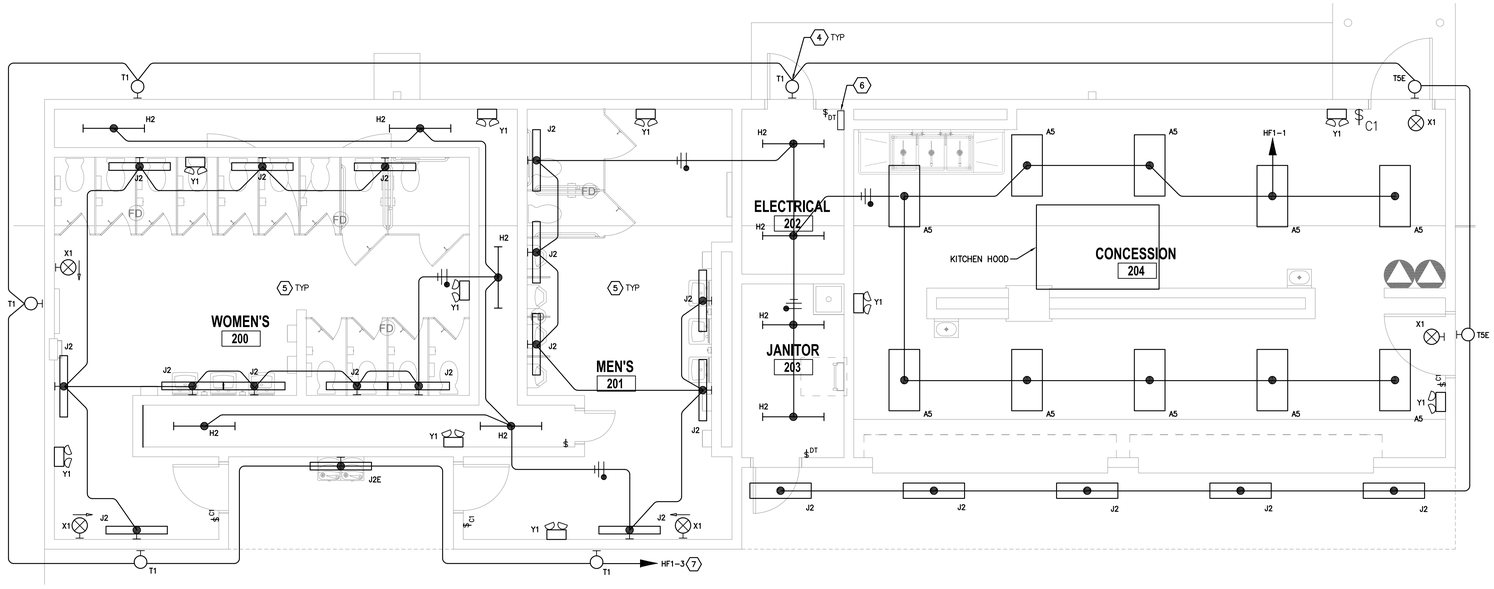
9 FAN SPEED CONTROL SWITCH PROVIDED WITH FAN. COORDINATE WITH MECHANICAL FOR ROUGH-IN REQUIREMENTS. COORDINATE FINAL LOCATION WITH OWNER PRIOR TO ROUGH-IN.

10 RECEPTACLE MOUNTED AT 84" A.F.F. FOR FUTURE OWNER PROVIDED OSCILLATING FANS.

11 SWITCH FOR HOOD LIGHTS AND PILOT SWITCH FOR SUPPLY/EXHAUST FANS. LABEL ACCORDINGLY.



02 FLOOR PLAN - POWER
SCALE: 1/4" = 1'-0"



EXIT SIGN WORDING SHALL BE THE COLOR 'RED'. TYPICAL FOR ALL EXIT SIGNS.

01 FLOOR PLAN - LIGHTING
SCALE: 1/4" = 1'-0"

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Williamson County, Texas

CONSTRUCTION DOCUMENTS
1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

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REFERENCE GENERAL NOTES ON SHEETS M1.1, P1.1, AND E1.1 FOR ADDITIONAL INFORMATION

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F1 A E D C B F2

PROJECT NO. 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 1/11/2019

SHEET TITLE:
FLOOR PLANS - LIGHTING & POWER

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
E2-1

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ELECTRICAL ROOF NOTES

A. COORDINATE PLACEMENT OF DISCONNECTS WITH MECHANICAL CONTRACTOR. DO NOT BLOCK ANY ACCESS DOORS WITH DISCONNECTS.

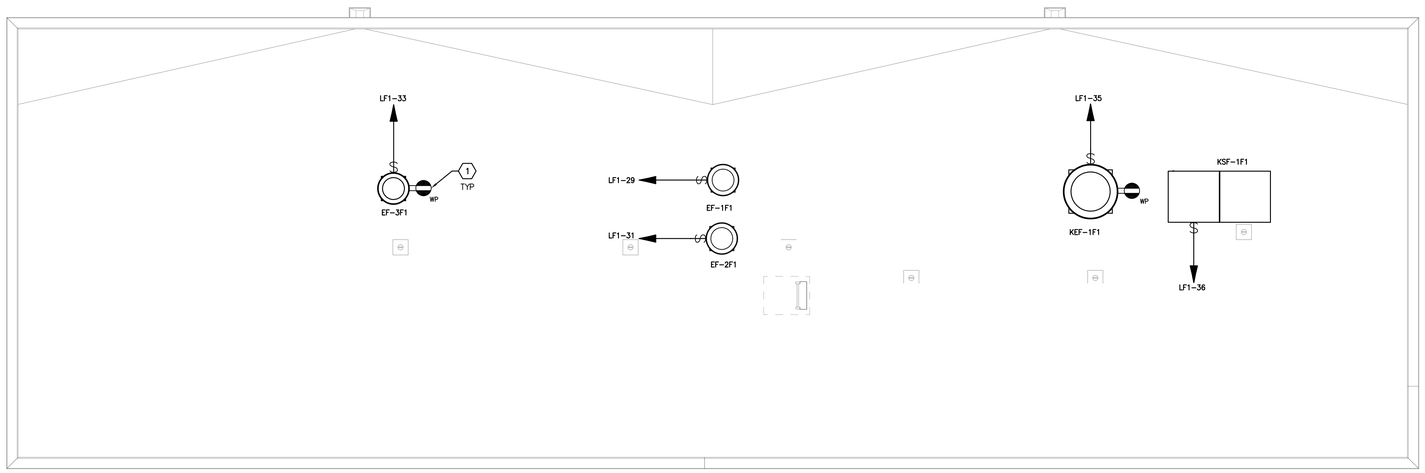
B. FIELD COORDINATE PLACEMENT AND MOUNTING REQUIREMENTS OF SERVICE RECEPTACLES. PLACE RECEPTACLES WITHIN 25' OF ALL EQUIPMENT.

C. REFERENCE MECHANICAL EXHAUST FAN SCHEDULE FOR CONTROL REQUIREMENTS OF FANS.

KEYED NOTES

THESE NOTES APPLY TO THIS SHEET ONLY

1. EQUIPMENT MAINTENANCE RECEPTACLE. CIRCUIT TO NEAREST RECEPTACLE CIRCUIT BELOW.



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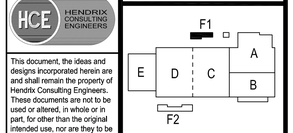

PROJECT NO. 14.3903 ISSUED BY: POPULOUS

ISSUED DATE: 1/11/2019

SHEET TITLE:
ROOF PLAN - ELECTRICAL

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET

E4.1

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AUDIO/VISUAL MULTIMEDIA LEGEND

SYMBOL	DESCRIPTION
GENERAL NOTE:	REFER TO DRAWINGS/SPECS FOR OUTLET HARDWARE TYPE/LAYOUT/DESIGN
AV# AV# AV#	GENERAL AUDIO/VISUAL OUTLET (LEFT TO RIGHT, WALL MOUNTED CEILING MOUNTED, FLOOR MOUNTED)
TWS PWS	TEACHER/PRESENTER WORK STATIONS
CP#	CONTROL PANEL
P## P##	PROJECTOR (LINE TO WALL DENOTES SHORT THROW/WALL MOUNT)
S# S#	SPEAKER (CEILING MOUNTED/WALL MOUNTED RESPECTIVELY)
VC	VOLUME CONTROL
1 2	DIGITAL CLOCK ("1" SIDED OR "2" SIDED RESPECTIVELY)
D#	DIGITAL DISPLAY
ENC	CEILING ENCLOSURE
EC#	AUDIO/VISUAL SYSTEMS WALL MOUNTED EQUIPMENT CABINET
HM	HANGING/CEILING MOUNTED MICROPHONE
ML#	MICROPHONE JACK/HOOKUP
PTT	PUSH TO TALK BUTTON
ECB	EMERGENCY CALL BUTTON FOR 2-WAY PA COMMUNICATIONS
ADP	ADMINISTRATIVE DISPLAY PHONE FOR 2-WAY PA COMMUNICATIONS
USB	USB OUTLET

PREMISE SECURITY LEGEND

SYMBOL	DESCRIPTION
CR CR M	CARD READER ("M" DENOTES MULLION MOUNTED)
KP	INTRUSION SYSTEM KEYPAD
IC IC MS	INTERCOM STATION ("MS" DENOTES INTERCOM MASTER STATION)
DB	DOOR BELL/BUZZER
LD	LOCKDOWN CONTROL/BUTTON
DR	DOOR RELEASE CONTROL
DR	DOOR RELEASE HARDWARE
PB	PANIC/DURESS BUTTON
DC	DOOR CONTACT/MONITOR
MD MD	MOTION DETECTOR (LINE DENOTES WALL MOUNT)
GB	GLASS BREAK SENSOR
	STANDARD IP SURVEILLANCE CAMERA, (1) CAT 6 CABLE
	180° IP SURVEILLANCE CAMERA, (1) CAT 6 CABLE
	360° IP SURVEILLANCE CAMERA, (1) CAT 6 CABLE

STRUCTURED CABLING LEGEND

SYMBOL	DESCRIPTION
#	TELECOMMUNICATIONS OUTLET, # =NUMBER OF CAT 5e VOICE/DATA CABLES/JACKS
#/#	TELECOMMUNICATIONS OUTLET, #/# = NUMBER OF CAT 5e DATA CABLES/JACK AND NUMBER OF CAT 5e VOICE CABLES/JACKS
#	TELECOMMUNICATIONS OUTLET, # =NUMBER OF CAT 5e VOICE/DATA CABLES/JACKS, SURFACE MOUNT
#/#	TELECOMMUNICATIONS OUTLET, #/# = NUMBER OF CAT 5e DATA CABLES/JACK AND NUMBER OF CAT 5e VOICE CABLES/JACKS, SURFACE MOUNT
W	WALL MOUNT PHONE (ONE CAT 5e CABLE/JACK)
W	WALL MOUNT PHONE, SURFACE MOUNT (ONE CAT 5e CABLE/JACK)
#	FLOOR MOUNTED OUTLET, # =NUMBER OF CAT 5e VOICE/DATA CABLES/JACKS (FLOOR BOX BY E.C.)
#/#	FLOOR MOUNTED OUTLET, #/# = NUMBER OF CAT 5e DATA CABLES/JACK AND NUMBER OF CAT 5e VOICE CABLES/JACKS (FLOOR BOX BY E.C.)
#	CEILING MOUNTED DATA OUTLET, # =NUMBER OF CAT 5e VOICE/DATA CABLES/JACKS
AP	CEILING MOUNTED OUTLET FOR WIRELESS ACCESS POINT (1 CAT 5e CABLE/JACK)
AP	WALL MOUNTED OUTLET FOR WIRELESS ACCESS POINT (1 CAT 5e CABLE/JACK)
D A C	IP BASED SURVEILLENCE CAMERA, (1) CAT 6 CABLE TERMINATED IN BACKBOX (APPLIES TO ALL STANDARD, 180°, AND 360° CAMERAS UNLESS NOTED OTHERWISE)

GENERAL SYMBOLS LEGEND

SYMBOL	DESCRIPTION
## T###	DETAIL REFERENCE (TOP = DETAIL NUMBER, BOTTOM = SHEET NUMBER)
	VIEWPORT/DETAIL NOTATION
(00)	KEYNOTES
MDF	MAIN DISTRABUTION FRAME
IDF	INTERMEDIATE DISTRABUTION FRAME
ETR	EXISTING TO REMAIN
PBO	PROVIDED BY OTHERS
AFF	ABOVE FINISHED FLOOR
AC	ABOVE COUNTER
UNO	UNLESS NOTED OTHERWISE
EC	DIVISION 26 ELECTRICAL CONTRACTOR
PSC	PREMISE SECURITY CONTRACTOR
SCC	STRUCTURAL CABLING CONTRACTOR
AVC	AV/MULTIMEDIA CONTRACTOR

TECHNOLOGY SHEET INDEX

	SHEET NUMBER	SHEET NAME
	T000	TECHNOLOGY - INDEX SHEET
	T010	TECHNOLOGY - SITE PLAN
	T100	TECHNOLOGY - OVERALL FLOOR PLAN
EXISTING - SHEET NOT INCLUDED	T101	TECHNOLOGY - FLOOR PLAN - AREA A
EXISTING - SHEET NOT INCLUDED	T102	TECHNOLOGY - FLOOR PLAN - AREA B
EXISTING - SHEET NOT INCLUDED	T103	TECHNOLOGY - FLOOR PLAN - AREA C
EXISTING - SHEET NOT INCLUDED	T104	TECHNOLOGY - FLOOR PLAN - AREA D
EXISTING - SHEET NOT INCLUDED	T105	TECHNOLOGY - FLOOR PLAN - AREA E
	T106	TECHNOLOGY - FLOOR PLAN - AREA F
EXISTING - SHEET NOT INCLUDED	T300	TECHNOLOGY - ELEVATIONS
	T500	TECHNOLOGY DETAILS
EXISTING - SHEET NOT INCLUDED	T501	TECHNOLOGY DETAILS
	T502	TECHNOLOGY DETAILS
EXISTING - SHEET NOT INCLUDED	T503	TECHNOLOGY DETAILS
	T504	TECHNOLOGY DETAILS

TECHNOLOGY - GENERAL NOTES

1. FURNISH = TO SUPPLY AND DELIVER TO PROJECT SITE, READY FOR INSTALLATION.
2. INSTALL = TO PLACE IN POSITION OF SERVICE OR USE.
3. PROVIDE = TO FURNISH AND INSTALL, COMPLETE READY FOR INTENDED USE.
4. ALL CABLES SHALL BE CONCEALED.
5. ALL CONDUIT MEASUREMENTS REFER TO STANDARD CONDUIT TRADE SIZES.
6. NOT ALL KEYNOTES MAY BE UTILIZED ON EVERY SHEET.
7. IT IS THE INTENT THAT EACH CONTRACTOR INCLUDE ALL REQUIRED MATERIALS FOR A NEATLY DRESSED CABLING PATHWAY SYSTEM AS INDICATED ON THESE DRAWINGS AND SPECIFICATIONS. ALL REQUIRED MATERIALS SHALL BE INCLUDED IN BID.
8. ALL CONDUIT ENDS TO HAVE NYLON BUSHING AND PULL STRING.
9. EACH CONTRACTOR SHALL PROVIDE AND INSTALL ALL NECESSARY SLEEVES, WHETHER OR NOT SPECIFICALLY NOTED ON PROJECT DRAWINGS. ALL SLEEVES SHALL BE 1-1/4" UNLESS NOTED OTHERWISE ON THE DRAWINGS. CABLE FILL PERCENTAGE SHALL COMPLY WITH NEC.
10. EACH CONTRACTOR SHALL MAKE NECESSARY ADJUSTMENTS IN J-HOOK SUPPORT PATHS TO AVOID CONFLICTS WITH HVAC AND ELECTRICAL DEVICES/EQUIPMENT AND WORK OF OTHER TRADES.
11. EVERYTHING SHOWN ON THE DRAWINGS SHALL BE PROVIDED AND INSTALLED BY THE APPROPRIATE CONTRACTOR UNLESS NOTED OTHERWISE. ALL CONDUIT, BACKBOXES, JUNCTION BOXES, FLOOR BOXES AND IN-WALL BOXES SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR (EC) UNLESS NOTED OTHERWISE.
12. DEVICE LOCATION: CONTRACTOR SHALL COORDINATE ALL AV/MULTIMEDIA DEVICE LOCATIONS WITH OWNER AND CONSULTANT DURING PRECONSTRUCTION PHASE. LOCATIONS SHOWN HEREIN ARE APPROXIMATE AND AV/MULTIMEDIA CONTRACTOR (AVC) SHALL DETAIL LOCATIONS IN PRECONSTRUCTION SUBMITTAL PLANS FOR CONSULTANT APPROVAL. CONTRACTOR SHALL NOT PROCEED WITHOUT WRITTEN APPROVAL OF SUBMITTED DRAWINGS.
13. ALL ELECTRICAL POWER WIRING FOR AUDIO/VISUAL CIRCUITS SHALL DEDICATED FOR AUDIO/VISUAL USE, SHALL BE ON THE SAME PHASE, AND SHALL NOT BE SHARED WITH OTHER BUILDING EQUIPMENT, INCLUDING BUT NOT LIMITED TO LIGHTING, HVAC, MECHANICAL, ETC.
14. DIV. 26 EC SHALL PROVIDE ALL CONDUIT, BACK BOXES, JUNCTION BOXES AND CUSTOM BOXES AS NOTED ON INFRASTRUCTURE DETAILS SHEET.
15. AT EACH DOOR WITH CARD READER, THE PREMISE SECURITY CONTRACTOR (PSC) SHALL PROVIDE AND INSTALL A DPDT DOOR POSITION SWITCH (CONNECTED TO BOTH THE ACCESS CONTROL SYSTEM AND THE INTRUSION DETECTION SYSTEM), CARD READERS, AND PROVIDE AND INSTALL ALL NECESSARY LOW-VOLTAGE WIRING FROM ELECTRONIC LOCKING HARDWARE (ELECTRIC STRIKE, POWERED CRASHBAR OR ELECTRIC TRIM/HINGE) TO POWER SUPPLIES. OTHERS WILL PROVIDE LOCKING HARDWARE. REQUEST TO EXIT DEVICE SHALL BE INTEGRAL TO THE DOOR HARDWARE.
16. DEVICE LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL REVIEW CONDITIONS AND COORDINATE WITH OTHER TRADES AS NECESSARY FOR EXACT PLACEMENT.

17. AUDIO/VISUAL/TECHNOLOGY SHEETS WERE ISSUED ON NOVEMBER 6, 2015. CONTRACTOR RESPONSIBLE TO VERIFY EXISTING CONDITIONS AND COORDINATE WHAT ITEMS ARE RELATED TO THE EAST CONCESSION & RESTROOM SCOPE OF WORK PRIOR TO BID.
18. NIC = NOT IN CONTRACT

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1/11/2019

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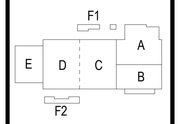

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 11/6/2015

SHEET TITLE:
TECHNOLOGY - INDEX SHEET

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
T000

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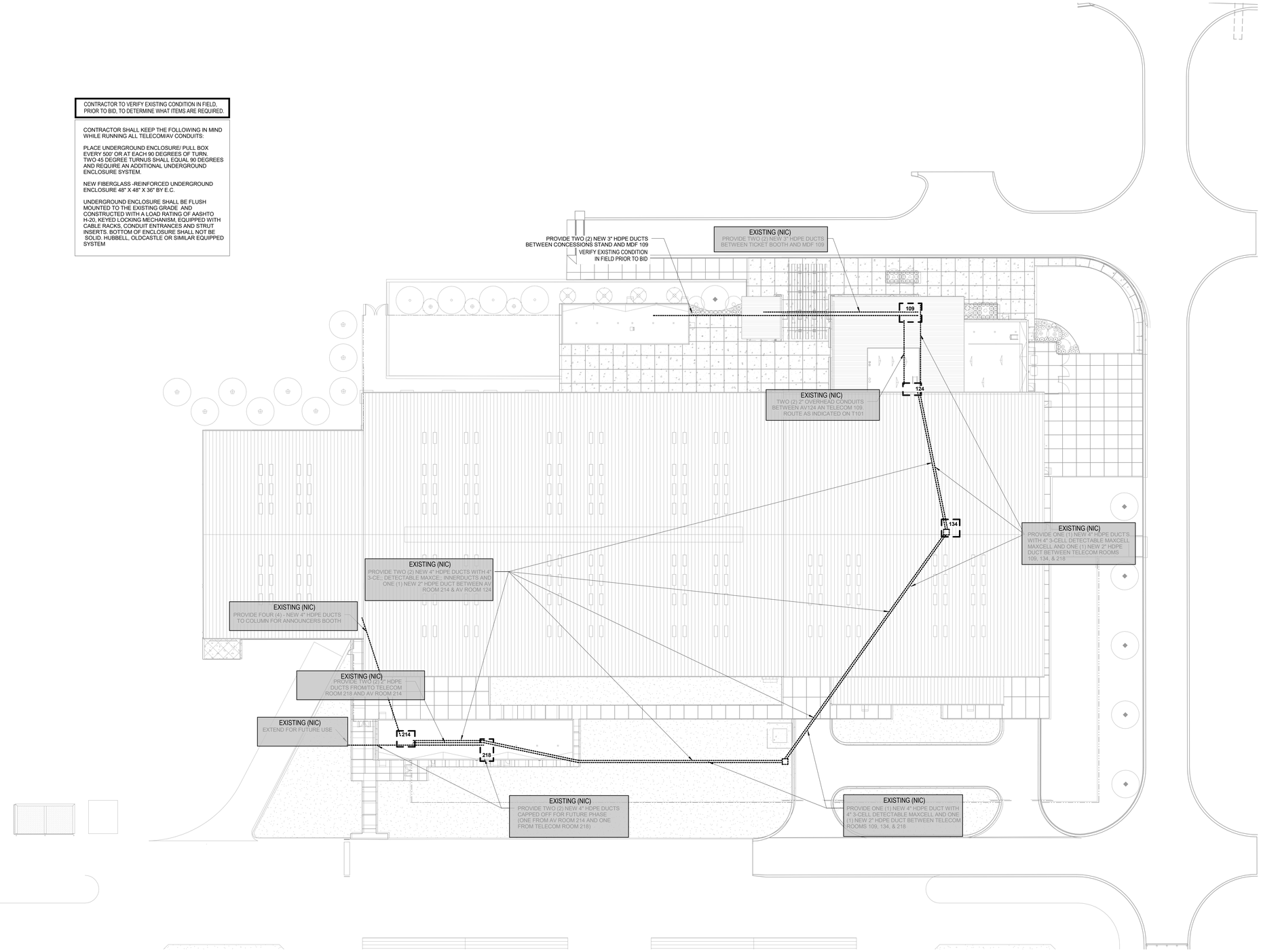
CONTRACTOR TO VERIFY EXISTING CONDITION IN FIELD, PRIOR TO BID, TO DETERMINE WHAT ITEMS ARE REQUIRED.

CONTRACTOR SHALL KEEP THE FOLLOWING IN MIND WHILE RUNNING ALL TELECOM/AV CONDUITS:

PLACE UNDERGROUND ENCLOSURE/ PULL BOX EVERY 500' OR AT EACH 90 DEGREES OF TURN. TWO 45 DEGREE TURNUS SHALL EQUAL 90 DEGREES AND REQUIRE AN ADDITIONAL UNDERGROUND ENCLOSURE SYSTEM.

NEW FIBERGLASS -REINFORCED UNDERGROUND ENCLOSURE 48" X 48" X 36" BY E.C.

UNDERGROUND ENCLOSURE SHALL BE FLUSH MOUNTED TO THE EXISTING GRADE AND CONSTRUCTED WITH A LOAD RATING OF AASHTO H-20, KEYED LOCKING MECHANISM, EQUIPPED WITH CABLE RACKS, CONDUIT ENTRANCES AND STRUT INSERTS. BOTTOM OF ENCLOSURE SHALL NOT BE SOLID. HUBBELL, OLDCASTLE OR SIMILAR EQUIPPED SYSTEM



1 TECHNOLOGY - LEVEL ONE - FLOOR PLAN
SCALE: 1" = 30'-0"

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F1 E D C A B F2

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 11/6/2015

SHEET TITLE:
TECHNOLOGY - SITE PLAN

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
T010

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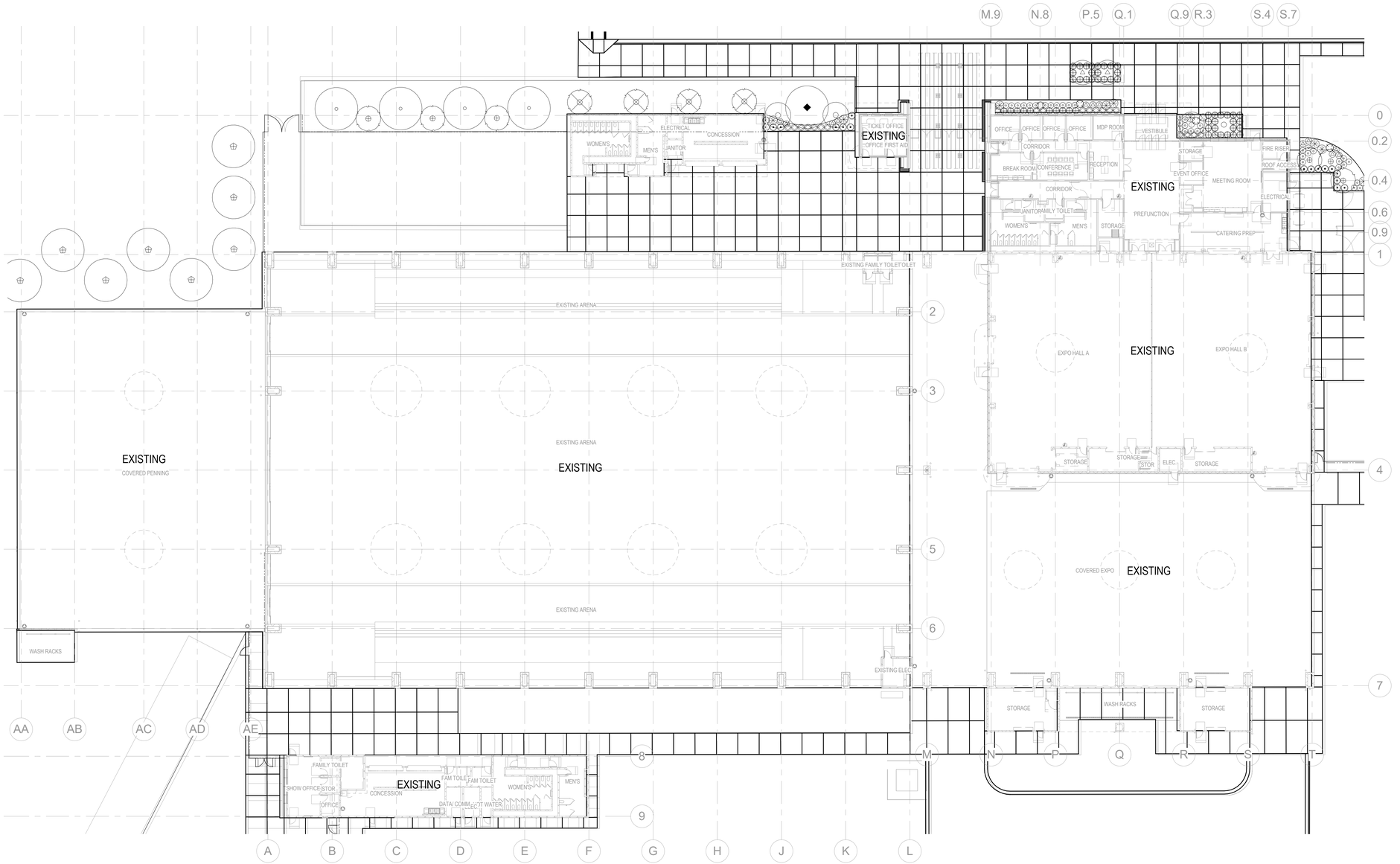

1 TECHNOLOGY - OVERALL FLOOR PLAN
SCALE: 3/64" = 1'-0"

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F2
A
B
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D
E

PROJECT NO: 14.3903
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ISSUED DATE: 11/6/2015

SHEET TITLE:
TECHNOLOGY - OVERALL FLOOR PLAN

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
T100

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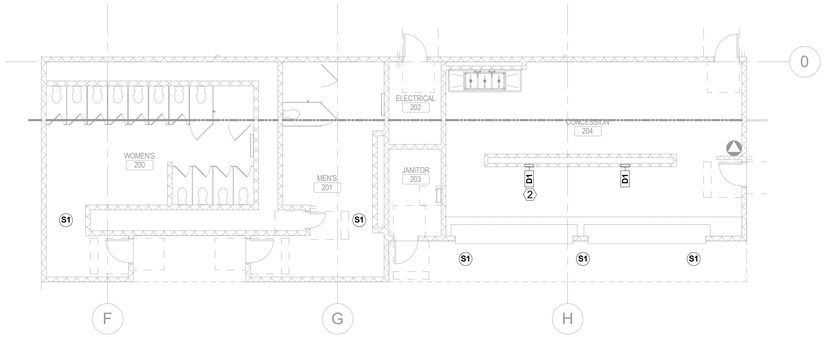
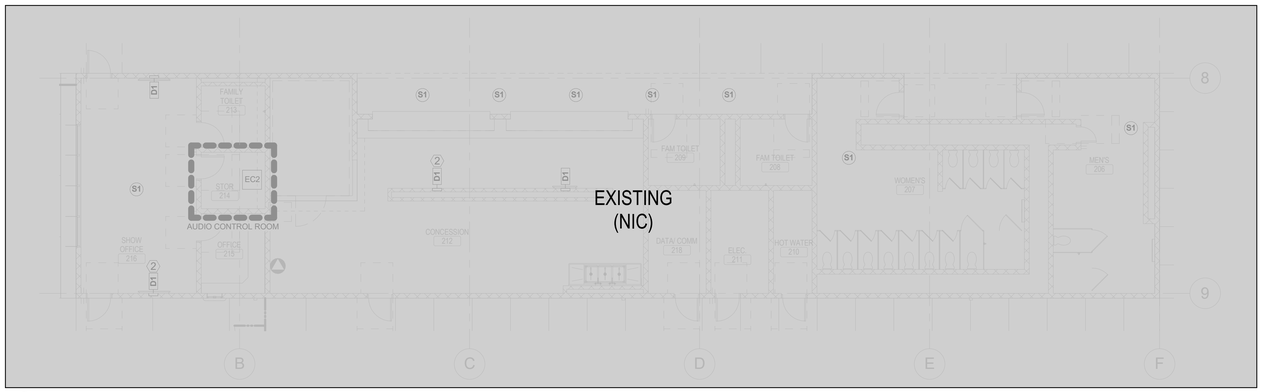


1 TECHNOLOGY - FLOOR PLAN - AREA F1
SCALE: 1/8" = 1'-0"



2 TECHNOLOGY - FLOOR PLAN - AREA F2
SCALE: 1/8" = 1'-0"

TECHNOLOGY - KEYNOTES

1. RIGGING FOR THESE PROJECTORS WILL ALLOW FOR 90 DEGREES OF ROTATION TO FOCUS ON PROJECT WEST SCREENS
2. ROUGH-IN ONLY.

PROJECT NORTH

NORTH

POPULOUS

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Architecture, Planning,
Interiors, Programming
300 Wyandotte, Suite 200
Kansas City, Missouri 64105
816/ 221-1500

Associate Architect
Morman Architecture
109 S. Harris St., Suite 200
Round Rock, TX 78644
512-733-1150

Structual Engineer
Engineering 360 Inc.
2851 Joe DiMaggio Blvd., Suite 22
Round Rock, TX 78665
512-244-1966

MEP/Energy Consultants
Hendrix Consulting Engineers
115 E Main St
Round Rock, TX 78664
512-218-0060

Civil Engineer/ Landscape
Halff Associates, Inc.
Two Sierra Way, Suite 105
Georgetown, TX 78626
512-942-6232

Audio/ Visual Consultant
True North Consulting Group
3408 Hillcrest Dr
Waco, TX 76708
512-451-5445

trueNORTH
consulting group
3408 Hillcrest Drive
Waco, TX 76708
ph.512.451.5445 fax: 512.451.8777
www.tncg.com

WILLIAMSON COUNTY EXPO CENTER

210 CARLOS PARKER BOULEVARD
TAYLOR, TEXAS 76574

Williamson County, Texas

CONSTRUCTION DOCUMENTS

1/11/2019

REVISIONS

NO.	DATE	DESCRIPTION

F1
E D C A B
F2

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 11/6/2015

SHEET TITLE:
TECHNOLOGY - FLOOR PLAN - AREA F

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
T106

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2/19/2019 2:38 PM
1/19/2017 1:17:10 PM

	ROOM		PROJECTION SCREEN (BY DIVISION AV CONTRACTOR)					PROJECTOR DISPLAY (BY DIVISION AV CONTRACTOR)				
Symbol	**Name**	**Number**	**Model**	**Size**	**Black Drop**	**Screen Surface**	**Comments**	**Model**	**Lumens**	**Lens**	**Mount**	**Distance (Screen to Lens)**
P1	Expo Hall	130A, 130B	Draper Premier	120"H x 192"W	24"	TechVision MS1000X Grey	Projectors that are located at project East will rotate 90 Degrees	Digital Projection HIGHlite Laser WUXGA 3D	11000	2.90 - 4.34 Lens	Structure	Varies 50' - 58'

1 PROJECTION SYSTEMS SCHEDULE - NIC
SCALE: NTS

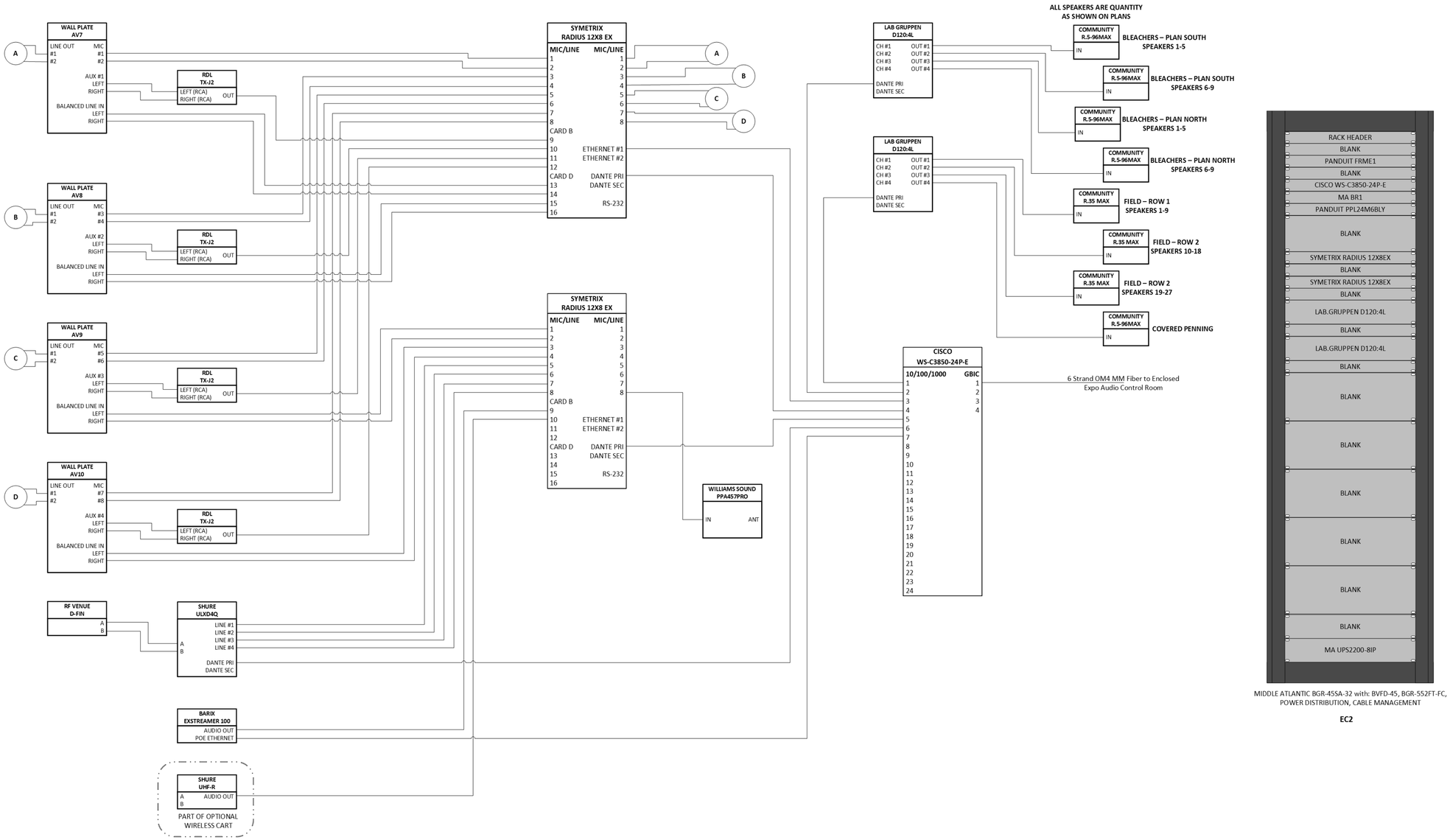
	PRODUCT			CONNECTED TO…		DIVISION	
Number	**Manufacturer**	**Model**	**Description**	**Paging**	**Program/Local**	**Provided By**	**Comments**
S1	Community	D8	8" Cut-In Speaker	X	X	27 41 50	Mount with Supplied Tile Bridge and Support to Structure- Tap at 15W
S2	n/a	n/a	(Not used)			n/a	NIC
S3	n/a	n/a	(Not used)			n/a	NIC
S4	Community	R.35COAX	Suspended or Mounted to Beam loudspeaker	X	X	27 41 50	Tap at 200W, NIC
S5	Community	R.5-96MAX	Suspended or Mounted to Beam loudspeaker	X	X	27 41 50	Provide with Commnity TRC-400-8 - 400W Transformer and tap at 400W , NIC

2 LOUDSPEAKER MODEL SCHEDULE
SCALE: NTS

Symbol	**Purpose**	**Size**	**Mount**	**Backbox**	**Box Hgt**	COMMENTS
D1	Digital signage - Digital Tightrope Carousel 250	55"-65"	Chief LTTU	Chief PAC526FCW	120" AFF TO CENTER	
D2	Conference Rooms and Signage	55"-70"	Chief LTTU	Chief PAC526FCW	120" AFF TO CENTER	NIC
	*** NOTE: CONFIRM HEIGHTS WITH ARCHITECT PRIOR TO INSTALLING BACK BOX***					

CONTRACTOR SHALL PROVIDE ALL DISPLAYS. DISPLAYS SHALL MEET THE FOLLOWING CRITERIA:
1. ALL DISPLAYS SHALL BE OF THE SAME MANUFACTURER AND MODEL SERIES/CLASS ACROSS THE PROJECT.
2. ALL DISPLAYS SHALL BE COMMERCIAL GRADE.
3. ALL DISPLAYS SHALL BE COMPATIBLE WITH SPECIFIED MOUNTS.
4. ALL DISPLAYS SHALL BE COMPATIBLE WITH SPECIFIED CONNECTIVITY.

3 FLAT PANEL DISPLAY SCHEDULE
SCALE: NTS



1 EXISTING ARENA – LINE DIAGRAM
SCALE: NTS

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CONSTRUCTION DOCUMENTS
1/11/2019

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F1 / E D C A B / F2

PROJECT NO. 14.3903 | ISSUED BY: POPULOUS
ISSUED DATE: 11/6/2015

SHEET TITLE:
TECHNOLOGY DETAILS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
T500

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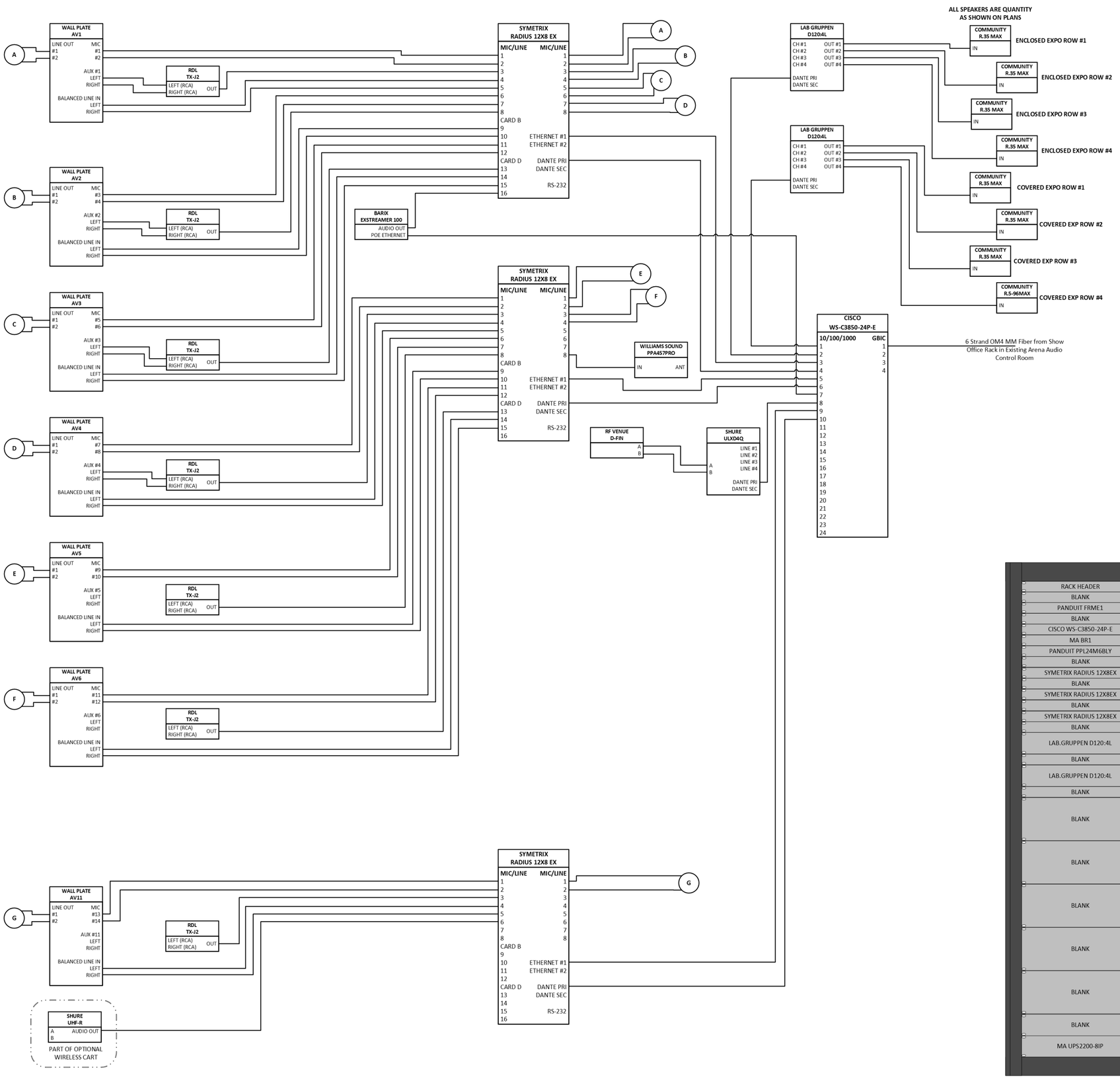
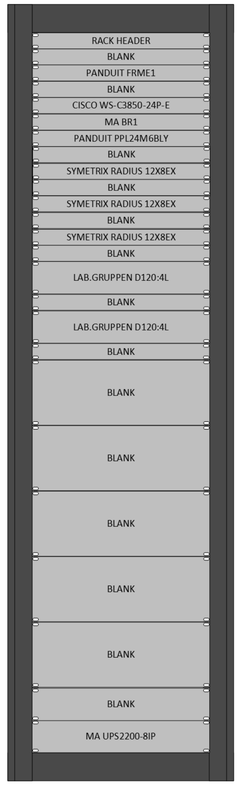
Williamson County, Texas
BIM 360:292-299
Page 714





MIDDLE ATLANTIC BGR-45SA-32 with: BVFD-45, BGR-552FT-FC, POWER DISTRIBUTION, CABLE MANAGEMENT

EC1

1 **ENCLOSED & COVERED EXPO – AUDIO LINE DIAGRAM**
SCALE: NTS

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PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 11/6/2015

SHEET TITLE:
TECHNOLOGY DETAILS

DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
T502

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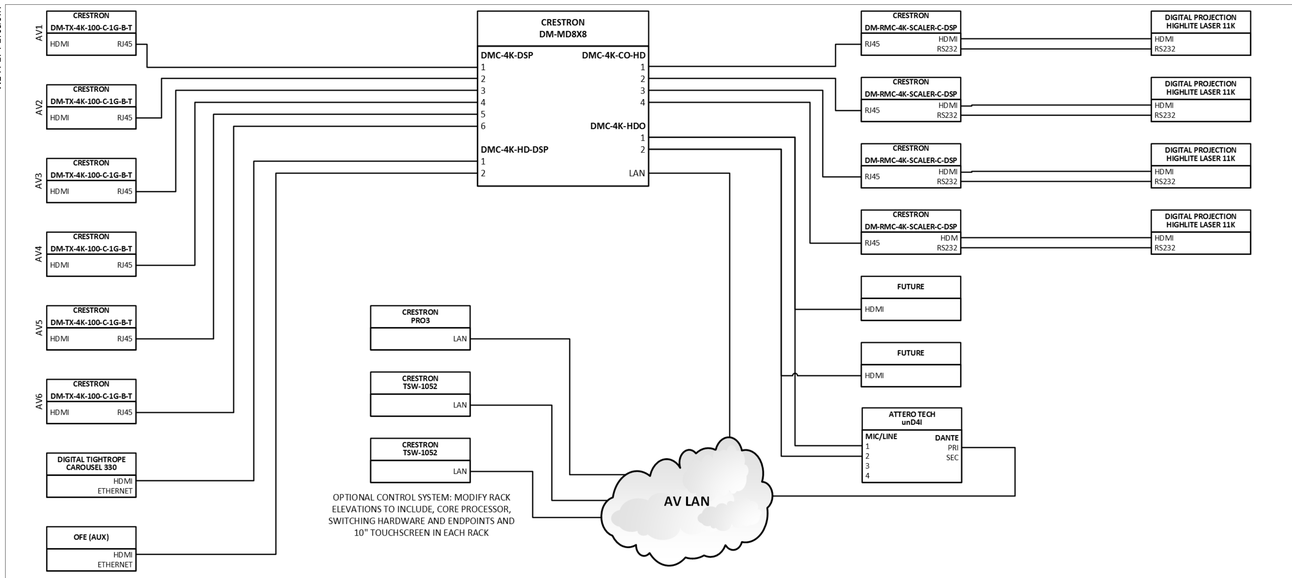
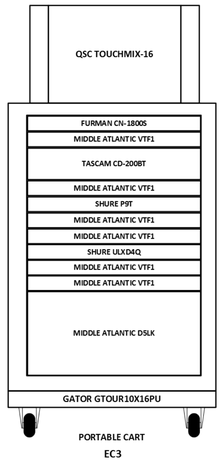
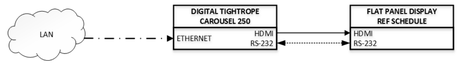
Bid 1802.299



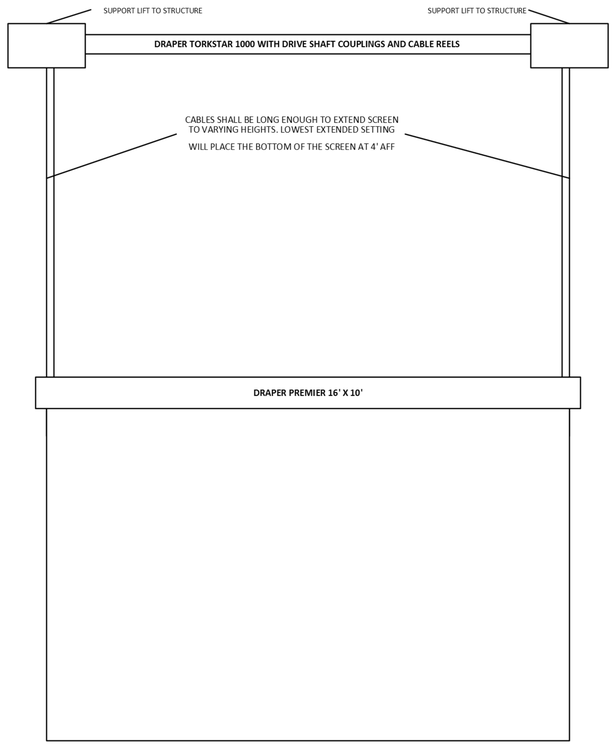
1 ENCLOSED EXPO – VIDED/ CONTROL LINE DIAGRAM
SCALE: NTS



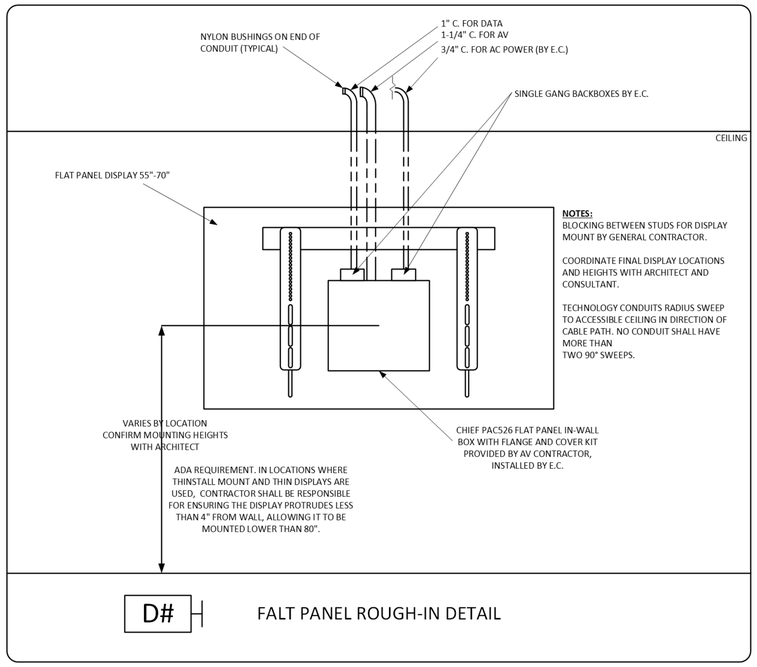
2 OPTIONAL WIRELESS MIXER/ CART
SCALE: NTS



3 OPTIONAL DIGITAL SIGNAGE SYSTEM
SCALE: NTS



4 ENCLOSED EXPO – PROJECTION SCREENS AND LIFTS
SCALE: NTS



5 FLAT PANEL MOUNTING DETAILS
SCALE: NTS

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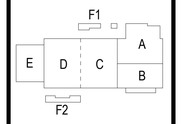

PROJECT NO: 14.3903
ISSUED BY: POPULOUS
ISSUED DATE: 11/6/2015
SHEET TITLE: TECHNOLOGY DETAILS
DISCIPLINE - CATEGORY - SUB CATEGORY - SHEET
T504

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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

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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.

§ 4.2 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.

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.

CONFLICT OF INTEREST QUESTIONNAIRE FORM CIQ

For vendor doing business with local governmental entity

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

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.

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:

Question and Answers for Bid #1902-299 - Williamson County Expo Center East Concession and Restrooms

Overall Bid Questions
There are no questions associated with this bid.